MECHANICAL PARTICULAR SPECIFICATION

For

CITY COLLEGE PLYMOUTH
MARINE TECHNOLOGY CENTRE

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R1 DISPOSAL SYSTEMS

R11 FOUL DRAINAGE ABOVE GROUND

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES:
Supply, install, commission and set to work a fully functional above ground drainage installation in accordance with the relevant British Standards and local Water Authority Bylaws.

To convey foul and waste water in a safe and efficient manner from the point of use to the below ground drainage system.

To provide a system suitable for the acidic nature of the condensate.

100.020 DESIGN PARAMETERS:
- Relevant parts of BS EN 12056
- Current Building Regulations Technical Guidance Documents and requirements of the Local Authority

100.030 SYSTEM DESCRIPTION:
The above ground drainage shall be a fully vented single pipe system, designed in accordance with the requirements of the OS, BS EN 12056 Part 2 and the Approved Document H of the Building Regulations as indicated on the drawings contained within this specification. The drainage shall be designed and installed to approved gradients to maintain the self cleansing velocity of the foul water pipe-work, and cleaning access points are to be installed on all changes of direction.

The Contractor shall extend the existing capped drainage connections at ground floor slab level to serve the site as indicated on the drawings. Where below ground drainage pop-ups are ‘heads of drain’ the Contractor shall extend the ventilation pipes to atmosphere via the roof as indicated on the drawings. Air admittance valves (AAV’s) shall be provided in lieu of soil vent pipes (SVP’s) terminating in suitable dust-free locations where indicated on the drawings.

Pipe-work 50mm diameter and above, penetrating fire barriers shall have fire collars installed as BS 476. This includes floor slabs, other than ground, where an access door shall also be provided prior to dropping to the floor below.

The drainage pipe-work shall be fully air pressure tested to a pressure equal to 3.8mbar and should remain constant for a minimum of 3 minutes, tests to be undertaken prior to the installation of any acoustic insulation.

Noise transfer from soil and waste pipe work shall be controlled to occupied zones and all noise shall be eliminated in compliance with room NR rating (refer to APPENDIX A – COMMON DESIGN CRITERIA). Where acoustic insulation is used; this shall be reinforced foil faced, Rockwool acoustic membrane and Rockwool insulation matting secured by aluminium bands with taped joints, all pipes are to have identification bands. All access covers shall have removable sections of insulation over, to provide unhindered access without the necessity to cause damage to the insulation.

Plant areas shall be provided with foul drainage gullies to receive plant drain downs. The gullies shall have internal removable traps to provide cleaning access, and water proof aprons to avoid water penetration.

Condensate drains for mechanical discharge shall be installed in each floor, connecting to stacks by means of a waterless trap installed in uPVC. Where indicated on drawings, condensate pumps shall be provided to route condensate to drain.

Any high temperature discharge pipework shall be in copper as indicated on the drawings.

100.040 CONTROL REQUIREMENTS:

There is no control requirements associated with this element of work.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS
Refer to PMTC-XX-XX-SP-M-003 ‘Y Sections’ for reference specifications

PART 3 SPECIFICATION CLAUSES SPECIFIC TO R11

300.000 GENERAL / PRODUCTS / MATERIALS
300.010 GALVANIZED STEEL PREFABRICATED STACK UNITS:
- Standard - BS 3868

300.011 CAST IRON PREFABRICATED STACK UNITS:
- Standard - BS EN 877 and to be Kite Marked.

300.015 METAL BANDED FLEXIBLE COUPLINGS ADAPTORS AND BUSHES:
- Type
- Flexible coupling without shear band.
- Flexible coupling with shear band.
- Flexible adaptor for use with pipes of different outside diameter.
- Standard - BS EN 16397-1 and BS EN 16397-2
- Materials
- Sleeve - rubber to BS EN 681-1
- Clamping bands
- 304 stainless steel.

300.020 FLOOR GULLIES:
- Standard
- Trapped with water seal of at least 50mm - BS EN 1253-1
- Without trap - BS EN 1253-2
- Class
- Class H 1,5 for areas where no load is expected
- Class K 3 for areas without vehicular traffic
- Class L 15 for areas with light vehicular traffic
- Class R 50 for areas with vehicular traffic
- Class M 125 for areas with vehicular traffic such as car parks, factories and workshops
- Access covers to BS EN 1253-4
- Class H 1,5 for areas where no load is expected
- Class K 3 for areas without vehicular traffic
- Class L 15 for areas with light vehicular traffic
- Class R 50 for areas with vehicular traffic
- Class M 125 for areas with vehicular traffic such as car parks, factories and workshops
- Gully with light liquid closure to avoid uncontrolled discharge of light liquids such as petrol, diesel and fuel oil into drainage systems in case of emergency to BS EN 1253-5
- Material
- Cast iron.

300.030 TRAPS:
- Standard
- Plastic to BS EN 274-1, BS EN 274-2, BS EN 274-3.
- Cast iron
- BS 416-1
- BS EN 877
- Copper alloy
- Chromium plated.

300.110 DOMICAL GRATINGS:
- Material
- Galvanized steel to manufacturer's standard.

300.130 PLASTICS WC PAN CONNECTOR:
- For horizontal outlet and shrouded pans.
- BS 5627 , for pans to BS EN 33, BS EN 997.

300.150 SINGLE STACK PLUMBING:
• Ensure that there is a change of gradient at stack connections. Use swept branches on small diameter pipes. Use swept inlet or 45 degree branch connections for pipe 75mm diameter or over.

300.160 AIR ADMITTANCE VALVES:
• Standard - BS EN 12380
• Ensure that there is a change of gradient at stack connections. Use swept branches on small diameter pipes. Use swept inlet or 45° branch connections for pipe 75mm diameter or over.

310.000 WORKMANSHIP
310.010 PERFORMANCE CRITERIA:
• Install pipework fittings and accessories to ensure that:-
• appliances drain quickly, quietly and completely at all times without nuisance or risk to health.
• discharge is conveyed without crossflow, backfall, leakage or blockage.
• air from drainage system does not enter building.
• pressure fluctuations in pipework do not vary by more than plus or minus 38mm water gauge and traps retain a water seal of not less than 25mm.
• system can be adequately tested, cleaned and maintained.

310.020 ROUTES:
• Ensure pipe routes are shortest practicable, with as few bends as possible and no bends in wet portion of soil stacks, unless indicated otherwise on drawings.

310.030 COATED PIPES:
• Make good damaged coatings and cut ends, or recoat, as recommended by manufacturer.

310.040 INSTALLATION GENERALLY:
• Install pipes, fittings and accessories in accordance with BS 8000-13, BS EN 12056-5 and manufacturer's recommendations.
• Install thermoplastic piping systems in accordance with PD CEN/TR 13801
• Obtain all components for each type of pipework from the same manufacturer, unless otherwise indicated.
• Inspect components carefully before fixing and reject any which are defective.
• Ensure cut ends of pipes to be clean and square with burrs removed.
• Allow for thermal and building movement when jointing and fixing.
• Form junctions using fittings intended for the purpose, ensuring that jointing material does not project into bore of pipes, fittings and appliances.
• Avoid contact between dissimilar metals and other materials which would result in electrolytic corrosion.
• Provide access covers and cleaning eyes as necessary in convenient locations, to permit adequate testing and cleaning of pipework.
• Prevent entry of foreign matter into any part of system by sealing openings during construction. Fit all access covers and cleaning eyes as work proceeds.

310.050 CONNECTIONS BETWEEN PIPES OF DIFFERENT MATERIALS:
• Plastic
• Connect plastics pipework to pipework of other materials using approved connectors and methods in accordance with plastics pipework manufacturer's recommendations, to form a watertight joint.
• Cast iron
• Connect cast iron pipework to clay pipework using supersleve adapters and in accordance with cast iron manufacturer's recommendations.
• Connect cast iron pipework to clay/concrete sockets with bituminised yarn and 1:3 cement:sand mortar, neatly finished, to form a watertight joint and in accordance with the cast iron manufacturer's recommendations.
• Copper
• Connect copper pipework to clay/concrete sockets using a caulking bush (brazed on), bituminised yarn and 1:3 cement:sand mortar, neatly finished, to form a watertight joint and in accordance with the copper manufacturer's recommendations.

• Connect copper pipework to cast iron sockets using a caulking bush (brazed on), bituminised yarn and an approved caulking compound, neatly finished, to form a watertight joint and in accordance with the copper manufacturer's recommendations.
• Connect copper pipework to cast iron using purpose made copper to iron connectors and in accordance with the copper manufacturer's recommendations.
• Galvanized steel
• Connect galvanized steel pipework to cast iron sockets with bituminised yarn and molten lead, lead wool or an approved cold caulking compound and in accordance with the galvanized steel manufacturer's recommendations.
• Connect galvanized steel pipework to clay/concrete sockets with bituminised yarn and 1:3 cement:sand mortar, neatly finished, to form a watertight joint and in accordance with the galvanized steel manufacturer's recommendations.

310.060 FOOT OF PIPE STACKS:
• Fix cast iron rest bends supported on brick-work or concrete bases where indicated on drawings.

310.070 WASTES:
• Bed in waterproof jointing compound and fix with resilient washer between appliance and backnut.

310.080 WASTE CONNECTORS:
• Join to traps as manufacturer's recommendations.

310.090 WC PANS:
• Plastic
• Connect all soil pipe spigots with plastic connectors in accordance with manufacturer's recommendations.
• Cast iron
• Connect to soil pipe connectors with WC jointing compound.

310.100 TRAP TEST REQUIREMENTS:
• Ensure there is a retention of a minimum of 25mm water seal in every trap, and that no air is blown through the trap seal when performance is tested.

310.110 ACCESS POINTS:
• Provide rodding and access points at all changes of direction to enable whole system to be maintained.
• Provide square door type access points as indicated on drawings at foot of all soil and ventilation pipes and at any subsequent floor levels as indicated on the drawings and/or as directed by building control. Where practicable, locate access points and horizontal anti-syphon pipes above fitment flood level a minimum of 1200mm above the respective finished floor level.
• In general make WC connections to drain points and soil pipes via flexible connectors.

BS APPENDIX

BS 4514:2001
Unplasticized PVC soil and ventilating pipes of 82.4mm minimum mean outside diameter, and fittings and accessories of 82.4mm and of other sizes. Specification

BS EN 33:2011
WC. pans and WC suites. Connecting dimensions

BS EN 274-1:2002
Waste fittings for sanitary appliances. Part 1 Requirements

BS EN 274-2:2002
Waste fittings for sanitary appliances. Part 2 Test methods

BS EN 274-3:2002
Waste fittings for sanitary appliances. Part 3 Quality control

BS EN 997:2012+A1:2015
WC pans and WC suites with integral trap

BS EN 1253-1:2015
Gullies for buildings. Trapped floor gullies with a depth water seal of at least 50 mm

BS EN 1253-2:2015
Gullies for buildings. Roof drains and floor gullies without trap

BS EN 1253-4:2016
Gullies for buildings. Access covers

BS EN 1253-5:2017
Gullies for buildings. Gullies with light liquids closure

BS EN 1329-1:2014+A1:2018
Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure. Unplasticized poly(vinyl chloride) (PVC-U). Specifications for pipes, fittings and the systems

BS EN 1363-1:2012
Fire resistance tests. General requirements

BS EN 1366-3:2009
Fire resistance tests for service installations. Penetration seals

BS EN 1366-4:2006+A1:2010
Fire resistance tests for service installations. Linear joint seals

BS EN 1453-1:2017
Plastics piping systems with structured-wall pipes for soil and waste discharge (low and high temperature) inside buildings. Unplasticized poly (vinyl chloride) (PVC-U). Part 1 Specifications for pipes and the system

BS EN 12056-1:2000
Gravity drainage systems inside buildings. Part 1 General and performance requirements

BS EN 12056-2:2000
Gravity drainage systems inside buildings. Part 2 Sanitary pipework, layout and calculation

BS EN 12056-3:2000
Gravity drainage systems inside buildings. Part 3 Roof drainage, layout and calculation

BS EN 12056-4:2000
Gravity drainage systems inside buildings. Part 4 Wastewater lifting plants. Layout and calculation

BS EN 12056-5:2000
Gravity drainage systems inside buildings. Part 5 Installation and testing, instructions for operation, maintenance and use

BS EN 12380:2002
Air admittance valves for drainage systems. Requirements, test methods and evaluation of conformity

BS EN 13501-2:2016
Fire classification of construction products and building elements. Classification using data from fire resistance tests, excluding ventilation services

BS EN 15014:2007
Plastics piping systems. Buried and above ground systems for water and other fluids under pressure. Performance characteristics for pipes, fittings and their joints

BS EN 16397-1:2014
Flexible couplings. Performance requirements

BS EN 16397-2:2014
Flexible couplings. Characteristics and testing for metal banded flexible couplings, adaptors and bushes

S1 WATER SUPPLY

S10 COLD WATER

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES:
Supply, install, commission and set to work a fully functional mains cold water, and potable tanked cold water as described within the specification and detailed on the drawings.

To ensure that the installation is compliant with Local Water Authority requirements and obtain written approval on the modified system where required.

To ensure that the capacity of any deadleg serving an outlet does not exceed 1.5 litres.

100.020 DESIGN PARAMETERS:
- For installations inside building comply with BS EN 806-2, BS EN 806-3 and supplementary guidance in BS 8558, CIBSE Guide G: Public Health & Plumbing Engineering, CIBSE TM13: Minimising the Risk of Legionnaires' Disease, HSE Approved Code of Practice L8 and associated guidance HSG274 Part 2 The control of legionella bacteria in hot and cold water systems.
- For water supply systems outside buildings comply with the requirements of BS EN 805.
- The requirements of England and Wales - The Water Supply (Water Fittings) Regulations 1999 as amended, the Water Act 2014 and The Construction Products Regulations 2013.
- Comply with appropriate WRAS guidance.

Pipework Velocity

Mains pressure/boosted	2m/s (max)
Gravity based systems	0.8m/s (or lower depending on pressure and location of draw offs)

100.030 SYSTEM DESCRIPTION:

Incoming Supply
A new metered 50mm dia mains cold water supply (MCWS) connection from the local utility network will be terminated in the plant room at a stop cock in MDPE. The Contractor shall extend this service as indicated on the drawings in (accordance with the water regulations) to serve plant room equipment (CAT5 booster set, Hot Water Supply (HWS) calorifier and pressurisation unit) as well as outlets across the site.

The building potable supply shall be fed directly from the MCWS with no break tank with double check valve provided on the incoming supply.

A CAT5 supply shall be provided to serve outlets as indicated on the drawings and shall generally serve Science Classrooms, Art Rooms, Construction Skills, Laundry and internal and external bin store wash down facilities.

CAT 5 Supply (non-potable)

A suitably sized wall mounted packaged CAT 5 booster set and integral break tank, located in the plant room, shall be provided supplying the CAT5 outlets (wall mouted bib tap with hose union connector) within the plant area, Marine Engineering and MAV as indicated on the drawings.

The booster set shall be provided a single pump and integral controls.

The system shall be fully compliant with the requirements of the Water Supply Authority.

General Cold Water/CAT 5 Distribution

Cold water pipe work shall run within corridors, service voids and zones distributing via risers to the point of use. Branches shall be complete with zonal isolation, testing and chlorination points. All final outlets to incorporate isolation valves for ease of maintenance.

The water services shall drop within sanitary ware back-panels, casing, ducts and stud partitions to serve final outlets. Where pipe work is to be located within stud partition it shall be of a continuous length i.e. no joints within the partition. Local isolation shall be provided to equipment and sanitary ware by quarter turn service and flow limiting valves.

Water services to outlet points shall be of the correct type, flow rate, pressure and temperature to meet the given standards.

Boiling Taps

Instantaneous boiling taps shall be provided to serve the Office 2 and the Breakout zone sink area with connection from the MCWS distribution.

The system shall be as Heatrae Sadia 'Aquatap' 2.5kW 'Boil' model (or equal and approved) and shall be installed to manufacturer's requirements with heating element located below the sink.

Pipework

All above ground pipework shall be installed in copper R250 (table X).

Pipe sleeves shall be provided through all walls and floors regardless of construction materials.

Where pipework exits walls, floors or ceilings the Contractor shall provide chromium plated brass split masking plates.

Valves

The Contractor shall install valves to ensure that the system and ancillary items are maintainable, fully operable and commissionable.

Insulation

All pipework, flanges, valves and ancillaries shall be insulated in foil faced mineral wool to Building Regulations standard and vapour sealed to protect against frost, surface condensation and heat gain.

In the boiler room the insulation shall be protected by an Aluminium cladding system.

Disinfection

The Contractor shall disinfect the entire cold water as described below:

- Carry out the following operations in accordance with BS EN 806-4 and complimentary guidance in BS 8558 and PD 855468.
- Flush system and introduce sterilisation chemical.
- Agree a list of sentinel points (outlets in a water system that poses the highest risk from infection) prior to disinfection and take samples from these points to ensure correct chlorine concentration.
- Leave system to stand for period of time indicated by the chemical manufacturer.
- Repeatedly flush system with clean water until all traces of chlorine have been removed - leave system filled.
- Submit samples to registered laboratory for microbiological analysis and report.
- Immediately prior to handover, retake samples and submit for analysis and report.
- Where necessary repeat disinfection of potable water system immediately prior to handover.

100.040 CONTROL REQUIREMENTS:
The CAT 5 booster sets shall be provided with integral control and be monitored via the BMS for fault.

Refer to PMTC-SDP-XX-XX-SP-M-002 ‘Controls Specification’ for further details

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS
Refer to PMTC-XX-XX-SP-M-003 ‘Y Sections’ for reference specifications

PART 3 SPECIFICATION CLAUSES SPECIFIC TO S10

300.000 PRODUCTS/MATERIALS

300.001 PRESSURE EQUIPMENT DIRECTIVE/PRESSURE EQUIPMENT REGULATIONS:
- All equipment and assemblies which fall within the scope of the Pressure Equipment Directive (PED) 2014/68/EU, implemented in the UK through The Pressure Equipment (Amendment) Regulations 2015 and the Pressure Equipment (Safety) Regulations 2016, must be tested by the manufacturers, and be certified as compliant with the Directive. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies.
- Only relevant equipment and assemblies certified as compliant shall be permitted under this specification, and any substitution put forward must also be compliant with the Directive.

300.005 APPROVALS:
- Ensure all water fittings and materials are listed in the Products and Materials Directory published by WRAS.

300.020 ORIFICE DISCS:
- Install orifice discs at connections to taps.

300.060 PACKAGED WATER BOOSTER SETS:
- Pressure booster set(s) to be complete with pump(s), control vessel (hydraulic accumulator), suction and discharge manifolds, control transducer, pre-wired control panel and interconnecting pipework assembled on a fabricated skid.
- Booster set to be WRAS approved.
- Type
- Single pump with break tank.
- Hydraulic accumulator
- Unit to include integrated 'flowjet' type flow-through, shut-off and discharge valve.
- Diaphragm material to be WRAS approved in accordance with relevant parts of BS 6920.
- Vessel to BS EN 13831.
- Provide isolation valves on suction and discharge side of pumps.
- Provide non-return valves on discharge side of each pump.
- Provide pressure gauge in discharge manifold.
- Controls
- Pump operation
- Constant pressure control by pump seed control.
- Alarms and indication
- Pump run and trip for each pump.
- Low water cut off.
- Audible alarm.
- Accessories
- Additional control module to provide surge protection on start-up or when power is restored by allowing only one pump to be enabled and pulsed for a pre-set time until a pre-set pressure is reached.
- Combined anti-vacuum, automatic air vent and surge protection valve supplied loose for fitting at top of risers

310.000 WORKMANSHIP

310.005 INSTALLATION AND COMMISSIONING GENERALLY:

- Install, test and commission systems to comply with BS EN 806-4 and complimentary guidance in BS 8558, Water Supply (Water Fittings) Regulations or Bylaws and equipment manufacturer's recommendations.
- England and Wales - The Water Supply (Water Fittings) Regulations 1999 as amended, the Water Act 2014 and The Construction Products Regulations 2013.
- Flushing and disinfection of services supplying water for domestic use to be carried out in accordance with BS EN 806-4 and following the guidance in BS 8558 and PD 855468. Refer to the pipework cleaning and chemical treatment section of this specification for details.
- Construct the system to ensure it is safe and without risks to health and where applicable incorporate in the final design/installation recommendations given in HSG274 Part 2.
- Locate sampling points following the guidance and recommendations in the code of practice for sampling and monitoring of hot and cold water services, BS 8554 and document these in a sampling plan prepared in accordance with BS EN ISO 5667-1.
- Undertake sampling following construction completion in accordance with the guidance and recommendations in BS 8554.
- Undertake microbiological tests on samples and provide the results as part of the handover documentation to demonstrate that the systems are clear of organisms of concern. Preserve and handle samples in accordance with BS EN ISO 5667-3.
- Install thermoplastics pipework in accordance with BS 5955-8.

310.010 CONNECTIONS TO TAPS AND APPLIANCES:

- Make final connections to taps and appliances.
- For electrical appliances connected to water mains, comply with the manufacturer's recommendations and requirements of BS EN 61770 as below:
- To prevent the backsiphonage of non-potable water into the water mains
- Flexible hose assemblies intended to be used as integral parts of appliances, to be in accordance with the standard
- Flexible hose assemblies designed for connecting appliances to drinking water installations to be in accordance with BS EN 13618.

310.030 INSTALLATION OF PRESSURE BOOSTER SETS:

- Install, test and commission pressure booster sets in accordance with manufacturer's recommendations.

BS APPENDIX

BS 476-7:1997
Fire tests on building materials and structures. Part 7 Method of test to determine the classification of the surface spread of flame of products

BS 476-20:1987
Fire tests on building materials and structures. Part 20 Method for determination of the fire resistance of elements of construction (general principles)

BS 1212-1:1990
Float operated valves. Part 1 Specification for piston type float valves (copper alloy body) (excluding floats)

BS 1212-2:1990
Float operated valves. Part 2 Specification for diaphragm type float operated valves (copper alloy body) (excluding floats)

BS 1212-3:1990
Float operated valves. Part 3 Specification for diaphragm type float operated valves (plastics bodied) for cold water services only (excluding floats)

BS 1212-4:2016

Float operated valves. Specification for compact type float operated valves for WC flushing cisterns (including floats).

BS 2879:1980
Specification for draining taps (screw-down pattern)

BS 5154:1991
Specification for copper alloy globe, globe stop and check, check and gate valves.
Partially replaced by BS EN 12288

BS 5955-8:2001
Plastics pipework (thermoplastics materials). Part 8 Specification for the installation of thermoplastic pipes and associated fittings for use in domestic hot and cold services and heating systems in buildings

BS 6675:1986
Specification for servicing valves (copper alloy) for water services

BS 6920-1:2014
Suitability of non-metallic materials and products for use in contact with water intended for human consumption with regard to their effect on the quality of the water. Specification

BS 6920-2.1:2014
Suitability of non-metallic materials and products for use in contact with water intended for human consumption with regard to their effect on the quality of the water. Methods of test. Samples for testing

BS 6920-2.2.1:2000+A3:2014
Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water. Methods of test. Odour and flavour of water. General method of test

BS 6920-2.2.2:2000+A1:2014
Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water. Methods of test. Odour and flavour of water. Method of testing odours and flavours imparted to water by multi-layered hoses and pipes

BS 6920-2.2.3:2000+A2:2014
Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of water. Methods of test. Odour and flavour of water. Method of testing tastes imparted to water by hoses for conveying water for food and drink preparation

BS 6920-2.3:2000+A1:2014
Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water. Methods of test. Appearance of water

BS 6920-2.4:2000+A1:2014
Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of water. Methods of test. Growth of aquatic micro-organisms test

BS 6920-2.5:2000+A2:2014
Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water. Methods of test. The extraction of substances that may be of concern to public health

BS 6920-2.6:2000+A2:2014
Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water. Methods of test. The extraction of metals

BS 6920-3:2000

Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water. High temperature tests

BS 8554:2015
Code of practice for the sampling and monitoring of hot and cold water services in buildings

BS 8558:2015
Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages. Complementary guidance to BS EN 806

BS 9999:2017
Fire safety in the design, management and use of buildings. Code of practice

BS EN 331:2015
Manually operated ball valves and closed bottom taper plug valves for gas installations for buildings

BS EN 558:2017
Industrial valves. Face-to-face and centre-to-face dimensions of metal valves for use in flanged pipe systems. PN and Class designated valves

BS EN 736-1:2018
Valves. Terminology. Definition of types of valves

BS EN 736-2:2016
Valves. Terminology. Definition of components of valves

BS EN 805:2000
Water supply. Requirements for systems and components outside buildings

BS EN 806-1:2000
Specifications for installations inside buildings conveying water for human consumption. Part 1 General

BS EN 806-2:2005
Specifications for installations inside buildings conveying water for human consumption. Part 2 Design

BS EN 806-3:2006
Specifications for installations inside buildings conveying water for human consumption. Pipe sizing. Simplified method

BS EN 806-4:2010
Specifications for installations inside buildings conveying water for human consumption. Part 4 Installation

BS EN 806-5:2012
Specifications for installations inside buildings conveying water for human consumption. Part 5 Operation and maintenance

BS EN 1074-1:2000
Valves for water supply. Fitness for purpose requirements and appropriate verification tests. General requirements

BS EN 1074-2:2000
Valves for water supply. Fitness for purpose requirements and appropriate verification tests. Isolating valves

BS EN 1092-1:2018
Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 1 steel flanges

BS EN 1092-2:1997
Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 2 cast iron flanges

BS EN 1092-3:2003
Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 3 copper alloy flanges

BS EN 1092-4:2002
Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 4 aluminium alloy flanges

BS EN 1213:2000
Building valves. Copper alloy stopvalves for potable water supply in buildings. Tests and requirements

BS EN 1254-2:1998
Copper and copper alloys. Plumbing fittings. Part 2 fittings with compression ends for use with copper tubes

BS EN 1254-3:1998
Copper and copper alloys. Plumbing fittings. Part 3 Fittings with compression ends for use with plastics pipes

BS EN 1366-3:2009
Fire resistance tests for service installations. Penetration seals

BS EN 1366-4:2006+A1:2010
Fire resistance tests for service installations. Linear joint seals

BS EN 10226-1:2004
Pipe threads where pressure tight joints are made on the threads. Taper external threads and parallel internal threads. Part 1 dimensions, tolerances and designation

BS EN 10226-2:2005
Pipe threads where pressure tight joints are made on the threads. Taper external threads and taper internal threads. Dimensions, tolerances and designation

BS EN 10226-3:2005
Pipes threads where pressure-tight joints are made on the threads. Verification by means of limit gauges

BS EN 13280:2001
Specification for glass fibre reinforced cisterns of one-piece and sectional construction, for the storage, above ground, of cold water

BS EN 13501-2:2016
Fire classification of construction products and building elements. Classification using data from fire resistance tests, excluding ventilation services

BS EN 13618:2016
Flexible hose assemblies in drinking water installations. Functional requirements and test methods

BS EN 13828:2003
Building valves. Manually operated copper alloy and stainless steel ball valves for potable water supply in buildings. Tests and requirements

BS EN 13831:2007
Closed expansion vessels with built-in diaphragm for installation in water

BS EN 14154-4:2014

Water meters. Additional functionalities

BS EN 14451:2005
Devices to prevent pollution by backflow of potable water. In-line anti-vacuum valves DN 8 to DN 80. Family D, type A

BS EN 16668:2016+A1:2018
Industrial valves. Requirements and testing for metallic valves as pressure accessories

BS EN 60034-5:2001
Rotating electrical machines. Part 5 Degrees of protection provided by the integral design of rotating electrical machines (IP code). Classification

BS EN 60034-6:1994, IEC 60034-6:1991
Rotating electrical machines. Part 6 Methods of cooling (IC Code)

BS EN 60034-30-1:2014
Rotating electrical machines. Efficiency classes of line operated AC motors (IE code)

BS EN 60038:2011
CENELEC standard voltages

BS EN 60529:1992+A2:2013
Degrees of protection provided by enclosures (IP code)

BS EN 61770:2009+A11:2018
Electric appliances connected to the water mains. Avoidance of backsiphonage and failure of hose-sets

BS EN 62262:2002
Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)

BS EN 80416-1:2009
Basic principles for graphical symbols for use on equipment. Part 1 Creation of symbol originals

BS EN 80416-2:2001
Basic principles for graphical symbols for use on equipment. Part 2 Form and use of arrows

BS EN 80416-3:2002+A1:2011
Basic principles for graphical symbols for use on equipment. Part 3 Guidelines for the application of graphical symbols

BS EN ISO 4064-1:2017
Water meters for cold potable water and hot water. Metrological and technical requirements

BS EN ISO 4064-2:2017
Water meters for cold potable water and hot water. Test methods

BS EN ISO 4064-3:2014
Water meters for cold potable water and hot water. Test report format

BS EN ISO 4064-4:2014
Water meters for cold potable water and hot water. Non-metrological requirements not covered in ISO 4064-1

BS EN ISO 4064-5:2017
Water meters for cold potable water and hot water. Installation requirements

BS EN ISO 5667-1:2006

Water quality. Sampling. Guidance on the design of sampling programmes and sampling techniques

BS EN ISO 5667-3:2012
Water quality. Sampling. Preservation and handling of water samples

BS EN ISO 9001:2015
Quality management systems. Requirements

BS EN ISO 9908:1998+A1:2011
Technical specifications for centrifugal pumps. Class III

BS EN ISO 17672:2016
Brazing. Filler metals

PD 855468:2015
Guide to the flushing and disinfection of services supplying water for domestic use within buildings and their curtilages

S11 HOT WATER

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES:
Supply, install, commission and set to work a fully functional hot water installation.

To control the risks of legionella of the modified system by generating water at 60°C and distributing it at not less than 60°C for primary distribution.

To ensure that the minimum temperature anywhere within the circulation system does not fall below 50°C under prolonged maximum draw off conditions.

To enable the modified system to be thermally sterilised by arranging the hot water generation plant to be capable of heating the system to 70°C.

100.020 DESIGN PARAMETERS:
- BS EN 806-2, BS EN 806-3 and complementary guidance in BS 8558, CIBSE Guide G: Public Health & Plumbing Engineering, CIBSE TM13: Minimising the Risk of Legionnaires' Disease, HSE Approved Code of Practice L8 and associated guidance HSG274 Part 2: The control of legionella bacteria in hot and cold water systems.
- Where required in the scope of works undertake calculation of design heat load and storage volume for domestic hot water in accordance with BS EN 12831-3.
- Comply with appropriate WRAS guidance.
- Unvented hot water storage systems to be complete with "unvented kits" and pressure regulating valve to comply with the Building Regulations safety requirements within Approved Document G3. Indirectly heated storage water heaters to comply with BS EN 12897.

System Guides

Peak demand and storage	CIBSE Guide G *'Public Health and Plumbing Engineering'*
Peak instantaneous flow/pipe sizing	IOP (Institute of Plumbing) – *'Plumbing Engineering Services Design Guide'*

Pipework Velocity

Pressurised systems	2m/s (max)
Gravity based systems	0.8m/s (or lower depending on pressure and location of draw offs)

Design Temperature

Ensure that the hot water systems are capable of being maintained at designated temperatures on a constant 24 hour basis.

100.030 SYSTEM DESCRIPTION:

Indirect Hot Water Calorifier

A pre-insulated, indirect hot water calorifier with stainless steel vessel shall be provided to meet the hot water demand of the site as indicated on drawings and schedules.

The calorifier shall be fed from the low temperature hot water (LTHW) constant temperature (CT) circuit and shall be provided with a 3kW immersion heater.

The calorifier shall be installed to manufacturer's requirements with ancillary valves/equipment as required installed on the incoming MCWS connection.

Distribution

MCWS shall feed the hot water generation plant via the cold water booster set, pressurising the hot water system.

From the hot water generation plant the hot water flow and pumped return circuits shall be run within the corridors and distribute to all floors through the piped services riser as shown on the drawings. The hot water shall be distributed through zone branch connections. Branch flow connections shall be provided with isolating valves accessed via main circulation corridors etc. Secondary return circulation legs shall be provided with thermostatic balancing valves. A secondary return pump shall be provided to circulate hot water around the building.

The water services shall drop within sanitary ware back-panels, casing, ducts and stud partitions to serve final outlets. Where pipe work is to be located within stud partition it shall be of a continuous length i.e. no joints within the partition. Local isolation shall be provided to equipment and sanitary ware by quarter turn service and flow limiting valves.

Thermostatic mixing valves (TMV's) shall be installed as indicated on the schematic drawings to ensure that hot water is provided at less than 43°C to mitigate the risk of scalding. TMV's are to be provided to all basins and sinks in pupil accessed areas.

All valves are to be certified as TMV3 compliant under WRC 'TMV Scheme' and shall only be used in the application for which it has the appropriate certification for. Copies of the certificate shall be required for the O&M manual.

The mixer valves shall be installed to the manufacturers' recommendations with strainers, isolating valves and non-return valves.

The installation shall ensure the maximum blended dead leg does not exceed 2m.

The TMV shall be suitable for blending hot and cold water of unequal pressures and should the cold supply fail; the TMV shall shutdown.

All thermostatic mixing valves shall be of the same manufacturer and be manufactured by one of the following manufacturers or equal and approved.

1. Caradon Mira Ltd
2. Meynall Ltd
3. Horne Valves Ltd

Where HWS is supplied at 60°C i.e. Catering Kitchens, Cleaners Sinks etc. then all outlets must be labelled "Hot Water Danger of Scalding".

Electric Water Heaters

An unvented, electric water heater with integral stores shall be installed to serve sanitary outlets within the Science Studio. The unit shall be provided with required unvented ancillaries as per manufacturer's recommendations to suit the inlet pressure.

Legionella

The system shall be designed specifically in accordance with statutory and recommended recognised guidance for the control of legionella. Recommendations as given by the department of health for the control of legionella in health care premises shall be adhered to and shall be applicable to this project. In this regard the following shall be noted.

a) The maximum hot water dead leg shall be limited to 3 metres. (3 metres unblended, 2 metres blended). It is noted that in some applications this is not always practical, if it is impossible to achieve these lengths then every effort must be made to minimise dead leg lengths by reviewing the hot water generator position and pipe work routes.
b) Trace heating self regulating maintenance tape shall be provided for all dead legs over 3m in length.
c) A vapour seal shall be applied to all mains, cold water and all domestic hot water in service voids etc. shall be insulated.
d) The cold water storage tanks must be designed to ensure that water is drawn equally from each section of the tanks to ensure that stagnation does not occur, i.e. mid connections to common headers etc.

Pipework

All above ground pipework shall be installed in copper R250 (table X).

Pipe sleeves shall be provided through all walls and floors regardless of construction materials.

Where pipework exits walls, floors or ceilings the Contractor shall provide chromium plated brass split masking plates.

Thermostatic Balancing Valves

Thermostatic balancing valves (TBV's) as Danfoss MTCV (or equal and approved) shall be installed as per manufacturers recommendations for regulation of the return circulation system which shall operate when temperature downstream of the valve falls beneath a pre-set temperature.

Pumps

A single head, stainless steel, glandless circulator shall be installed on the return pipework to the calorifier. The pump shall be enabled via the BMS and monitored for fault.

A stand-by secondary return pump shall be provided as a spare.

Valves

The Contractor shall install valves to ensure that the system and ancillary items are maintainable, fully operable and commissionable.

As indicated on the schematic drawings, isolation valves to teaching spaces shall be located within a locked accessible enclosure for teaching staff and shall incorporate lever operated handles and be identifiable.

Thermal Insulation

The Contractor shall include for thermal insulation to the following pipework and in accordance with this Specification. All insulation shall be green guide cat A+ or A compliant serving the following (but not limited to):

1. All pipe work and valves in plant rooms and tank rooms.
2. All pipe work and valves within ceiling voids and roof voids.
3. All pipe work and valves within the service voids and boxings.
4. All concealed pipe work and valves shall be insulated.
5. All locations where there is a risk of pipe contents freezing.
6. All thermal insulation shall pass through the pipe support clip, with a suitable load bearing insert.

All pipework, flanges, valves and ancillaries shall be insulated in foil faced mineral wool.

In the boiler room the insulation shall be protected by an Aluminium cladding system.

Disinfection

The Contractor shall disinfect the entire cold water as described below:

- Carry out the following operations in accordance with BS EN 806-4 and complimentary guidance in BS 8558 and PD 855468.
- Flush system and introduce sterilisation chemical.
- Agree a list of sentinel points (outlets in a water system that poses the highest risk from infection) prior to disinfection and take samples from these points to ensure correct chlorine concentration.
- Leave system to stand for period of time indicated by the chemical manufacturer.
- Repeatedly flush system with clean water until all traces of chlorine have been removed - leave system filled.
- Submit samples to registered laboratory for microbiological analysis and report.
- Immediately prior to handover, retake samples and submit for analysis and report.
- Where necessary repeat disinfection of potable water system immediately prior to handover.

Expansion and Contraction

The Contractor shall make due allowance within his tender for the design, selection and installation of all measures to allow for expansion and contraction. This shall be in the form of loops, bellows, anchors, guides, offsets, rollers/chairs and cold draw. Wherever feasible; natural flexibility solutions shall be employed. All provisions for expansion and contraction shall be indicated on the fabrication drawings submitted with the supporting calculations to the Engineer for comment prior to installation taking place.

In the event that natural flexibility cannot be used due to building fabric restraints, bellows shall be installed which shall be multi-layered stainless steel (316L) quality units.

100.040 CONTROL REQUIREMENTS:
The HWS circulator pump shall be enabled and monitored for fault via the BMS.

Refer to PMTC-SDP-XX-XX-SP-M-002 'Controls Specification' for further details

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS
Refer to PMTC-XX-XX-SP-M-003 'Y Sections' for reference specifications

PART 3 SPECIFICATION CLAUSES SPECIFIC TO S11

300.000 PRODUCTS / MATERIALS:
- Comply with EU Regulation 814/2013 with regard to ecodesign requirements for water heaters with rated heat output of up to 400kW and hot water storage tanks with a storage volume of up to 2000 litres regarding limiting standing loss and product information. Manufacturers to comply with the test methods in BS EN 50440 to measure the performance of electric storage water heaters.

300.001 PRESSURE EQUIPMENT DIRECTIVE/PRESSURE EQUIPMENT REGULATIONS:
- All equipment and assemblies which fall within the scope of the Pressure Equipment Directive (PED) 2014/68/EU, implemented in the UK through The Pressure Equipment (Amendment) Regulations 2015 and the Pressure Equipment (Safety) Regulations 2016, must be tested by the manufacturers, and be certified as compliant with the Directive. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies.
- Only relevant equipment and assemblies certified as compliant shall be permitted under this specification, and any substitution put forward must also be compliant with the Directive.

300.005 APPROVALS:
- Ensure all water fittings and materials are listed in the Products and Materials Directory published by WRAS.

300.040 ORIFICE DISCS:
- Install orifice discs at connections to taps.

300.050 THERMOSTATIC MIXING VALVES:
- Type
- Application
- Shower (mixed water temperature 41°C).
- Wash hand basin (mixed water temperature 41°C).
- Group mixing, single valve to serve multiple outlets.
- Maximum static pressure (kPa) 150
- Valves to be WRAS approved.
- All non-metallic parts in contact with water shall meet WRAS requirements or comply with relevant parts of BS 6920 and BS EN 15768
- Valves to be independently tested and approved to BuildCert scheme:
- TMV3.
- Standard/type
- BS EN 1111 for high operating pressure (Static up to 10bar and dynamic 1-5bar)
- Type 1 - single control.
- Type 2 - dual control.
- Type 3 - single sequential control.
- BS EN 1287 for low operating pressure (Static up to 10bar and dynamic 0.2-1bar)
- Type 1 - single control.
- Type 2 - dual control.
- Type 3 - single sequential control.
- Material
- Body - DZR brass.
- Finish
- Chrome plated

300.055 THERMAL CIRCULATION VALVES:
- Type
- Thermostatically controlled self-balancing.
- Application
- Thermostatic regulation of return water temperature in HWS systems with circulation pump.
- Thermal disinfection at temperatures above 70°C.
- Location
- In return pipework from each run of fittings.

- Standard
- WRAS approved
- Materials
- Body - bronze to BS EN 1982.
- Bonnet and associated parts - DZR brass.
- Stem - stainless steel.
- O-Ring seals - EPDM rubber, WRAS approved.
- Body seat - PTFE.
- +/- 2°C at set temperature.
- Features
- Temperature gauge access point.
- Adjustable temperature setting facility.
- Additional thermostatic insert to increase flow when temperature of 70°C to effect disinfection.
- Integral isolation valve.

300.060 MECHANICAL MIXING VALVES:
- Standard
- BS EN 1286
- Single control for adjusting flow rate and temperature.
- Other mixing valves with separate control devices for adjusting flow rate and temperature.

300.080 EXPANSION VESSELS:
- Standards
- Supply WRAS approved expansion vessels for unvented hot water supply systems in accordance with the following standards:
- BS 6144
- BS EN 13831
- Relevant parts of BS 6920

310.000 WORKMANSHIP

310.005 INSTALLATION AND COMMISSIONING GENERALLY:
- Install, test and commission systems to comply with equipment manufacturer's recommendations, BS EN 806-4, complimentary guidance in BS 8558 and relevant Water Supply (Water Fittings) Regulations or Byelaws and equipment manufacturer's recommendations
- England and Wales - The Water Supply (Water Fittings) Regulations 1999 as amended, the Water Act 2014 and The Construction Products Regulations 2013.
- Flushing and disinfection of services supplying water for domestic use to be carried out in accordance with BS EN 806-4 and following the guidance in BS 8558 and PD 855468. Refer to the pipework cleaning and chemical treatment section of this specification for details.
- Construct the system to ensure it is safe and without risks to health and where applicable incorporate in the final design/installation recommendations given in HSG274 Part 2.
- Locate sampling points following the guidance and recommendations in the code of practice for sampling and monitoring of hot and cold water services, BS 8554 and document these in a sampling plan prepared in accordance with BS EN ISO 5667-1.
- Undertake sampling following construction completion in accordance with the guidance and recommendations in BS 8554.
- Undertake microbiological tests on samples and provide the results as part of the handover documentation to demonstrate that the systems are clear of organisms of concern. Preserve and handle samples in accordance with BS EN ISO 5667-3.
- Install thermoplastics pipework in accordance with BS 5955-8.
- Undertake thermal balancing of HWS and CWS systems in accordance with Commissioning Specialist Association TM19.

310.020 CONNECTIONS TO TAPS AND APPLIANCES:
- Make final connections to taps and appliances.
- For electrical appliances connected to water mains, comply with the manufacturer's recommendations and requirements of BS EN 61770 as below:

- To prevent the backsiphonage of non-potable water into the water mains
- Flexible hose assemblies intended to be used as integral parts of appliances, to be in accordance with the standard
- Flexible hose assemblies designed for connecting appliances to drinking water installations to be in accordance with BS EN 13618.

310.030 WATER HEATER INSTALLATION:
- Comply with manufacturer's instructions and recommendations for the installation of heater.
- Locate heater with adequate surrounding space for service and maintenance.

310.040 INSTALLATION AND COMMISSIONING OF THERMOSTATIC MIXING VALVES:
- Install and commission thermostatic mixing valves and mechanical mixing valves in accordance with manufacturer's recommendations.
- For TMV2 and TMV3 approved valves comply with the scheme's installation and maintenance documentation requirements.
- For TMV3 approved valves comply with the scheme onsite testing requirements.

BS APPENDIX

BS 476-7:1997
Fire tests on building materials and structures. Part 7 Method of test to determine the classification of the surface spread of flame of products

BS EN 16297-1:2012
Pumps. Rotodynamic pumps. Glandless circulators. . General requirements and procedures for testing and calculation of energy efficiency index (EEI)

BS EN 16297-3:2012
Pumps. Rotodynamic pumps. Glandless circulators. Energy efficiency index (EEI) for circulators integrated in products

S3 GAS SUPPLY

S30 COMPRESSED AIR

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES:

The Contractor is to be responsible for the detailed design development of the systems in accordance with the specification and drawings, including verification of design, co-ordination with other contractors and development of design to installation level detail.

To employ a specialist installer to be design, install and commission a full compressed air installation to meet the requirements of the building.

100.020 DESIGN PARAMETERS:

All systems and components shall be selected, manufactured and installed in accordance with the latest version of all applicable BS/BSEN and CIBSE/HVCA standards.

Flowrate:	1000l/min
Operating pressure:	7Bar
Air Quality Standard:	2.4.2 (instrument air) to ISO 8573-1.2010

100.030 SYSTEM DESCRIPTION:

The Contractor shall employ a specialist installer to undertake the design, installation and commissioning of a full compressed air installation to meet the requirements of the ground floor practical spaces as indicated on the drawings.

The preliminary design has been developed with the assistance of the following:

TSB Engineering Ltd
David Robson
david@tsbengineering.co.uk
07958 428623

Packaged Compressor Equipment

A packaged compressed air plant comprising of a rotary screw, variable speed drive compressor with integral refrigerant dryer, primary filter and 250 litre air receiver shall be located plant room. The plant shall be capable of providing oil free, dry air at 7 bar (Max 10 bar) pressure at the outlets.

Drain lines from the filter, receiver and dryer shall connect into the drain manifold via an automatic electronic condensate drain valve, prior to connecting into an oil/water separator. The drain from the oil/water separator shall be routed to a condensate lifting pump and routed to the low level copper foul drain within the plant area via a waterless trap.

Proposed equipment (or equal and approved) as follows:

- Compresser - Atlas Copco GA7VSD+ Compressor
- Filter - Atlas Copco UD25+ Dual Purpose Particulate Filtration
- Air Receiver - Atlas Copco LV250 Galvanised Air Receiver 11 bar
- Electronic Drain - Atlas Copco EWD50 Electronic Drain
- Oil/Water Separator - Atlas Copco OSC35 Condensate Unit.
- Condensate Pump - TBC by speacialist

Distribution

A new 25mm compressed air ring main shall run from the compressor / dryer, through a primary filter, receiver and then onto the ground floor practical spaces as indicated on the drawings, where 20mm drops including a ball valve, secondary filter, regulator and twin quick release couplers shall be provided.

Automatic drain traps shall be provided where required (**TBC by the client**) such as system low points and drops.

Pipework shall be routed at high level within the space below the suspended ceiling.

Pipework and Ancillaries

Pipework, bends, union connections and tees shall be installed in extruded aluminium with a minimum max working pressure rating of 13bar.

The Contractor shall agree the colours and finishes of all exposed materials of the system(s) with the Contract Administrator.

Ventilation

The plant room shall be provided with suitable natural ventilation to serve the compressed air system.

Should there be a requirement to duct to the facade, the specialist shall allow for the installation and agree the principals with the Contract Administrator.

Responsibilities

To employ a specialist to supply, install, test and commission a complete compressed air installation as detailed on the drawings.

The specialist shall extend power supplies from the local isolator provided by the Electrical Contractor.

Testing And Commissioning

Test and commission the compressed air equipment and plant in accordance with the manufacturer's instructions.

100.040 CONTROL REQUIREMENTS:
The compressor plant shall be a self-contained packaged unit with integral electronic controls and shall be monitored via the BMS for fault.

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS
Refer to PMTC-XX-XX-SP-M-003 'Y Sections' for reference specifications

PART 3 SPECIFICATION CLAUSES SPECIFIC TO S30
300.000 GENERAL

300.001 PRESSURE EQUIPMENT DIRECTIVE/PRESSURE EQUIPMENT REGULATIONS:
- All equipment and assemblies which fall within the scope of the Pressure Equipment Directive (PED) 2014/68/EU, implemented in the UK through the Pressure Equipment (Amendment) Regulations 2015 and The Pressure Equipment (Safety) Regulations 2016, must be tested by the manufacturers, and be certified as compliant with the Directive. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies.
- Only relevant equipment and assemblies certified as compliant shall be permitted under this specification, and any substitution put forward must also be compliant with the Directive.

300.005 COMPRESSED AIR QUALITY (PURITY):
- Compressed air purity classification for specific applications after local filters and/or dryers in accordance with BS ISO 8573-1 (Particles:Water:Oil) shall be as follows
- Purity class to BS ISO 8573-1 2.4.2
- Test methods for the range of contaminants to be in accordance with Parts 2-9 of BS ISO 8573.

300.010 CONDITIONS:
- Achieve maximum duty when operating at altitudes between sea level and 150 metres above sea level at ambient temperature up to 32oC with a relative humidity of 85%.

300.020 INFORMATION PLATES:
- Provide non-ferrous metal information plates with complete data on compressor, motor and receiver.

300.030 WORKS INSPECTION:
- Include for inspection at manufacturer's works by Insurance Company inspector or other person appointed in accordance with applicable regulations.

300.040 PERFORMANCE TESTS:
- Standards
- Carry out performance tests for displacement compressors in accordance with BS ISO 1217 and BS EN 286-1 for air receivers when part of a packaged unit.
- Carry out performance tests for air receivers in accordance with BS EN 286-1.
- Undertake acoustic tests in accordance with BS EN ISO 2151 to determine sound power levels.

310.000 PRODUCTS/MATERIALS

310.060 AIR FILTERS:
- Type
- Application
- Manufacturer and referencet
- Standards
- Test coalescing filters for removal of oil aerosols in accordance with BS ISO 12500-1
- Test adsorbent filters for removal of oil vapours and odours in accordance with BS ISO 12500-2
- Test coalescing and dust removal filters for removal of solid particulates in accordance with BS ISO 12500-3
- Comply with the requirements of the relevant parts of BS ISO 5782 for the characteristics of filters to be included in product literature and product marking requirements.
- Required compressed air quality class after filter BS ISO 8573-1
- Connections
- Flanged to BS EN 1092-3 PN
- Fabricated steel, flanged to BS EN 1092-1
- Cast Iron, flanged to BS EN 1092-2
- Aluminium Alloy, flanged to BS EN 1092-4
- Screwed to relevant parts of BS EN 10226.
- Protection
- General purpose.

- Oil free.
- Odour and vapour removal.
- Ancillaries
- Differential pressure monitoring gauge.
- Automatic drain trap.
- Manual drain trap.
- Two stage combination units.

310.062 COMPRESSED AIR LUBRICATORS:
- Type
- Micro mist lubricator to automatically inject a mist of oil into the air stream to automatically provide the correct amount of lubrication.
- Internal lubrication of air tools and other pneumatic devices.
- Manufacturer and reference.
- Standards
- Comply with the requirements of BS ISO 6301-1 and BS ISO 6301-2 for testing, marking and product literature.
- Polycarbonate bowl to BS 6005
- Screwed to relevant parts of BS EN 10226
- Ancillaries
- Drain.

310.065 WATER SEPARATORS:
- Type
- Application
- Manufacturer and reference
- Or approved equivalent
- Standard – test in accordance with BS ISO 12500-4.
- Material
- Cast aluminium alloy.
- Connections
- Flanged to BS EN 1092-3 PN
- Fabricated steel to BS EN 1092-1
- Cast iron, flanged to BS EN 1092-2
- Aluminium Alloy, flanged to BS EN 1092-4
- Screwed to relevant parts of BS EN 10226.
- Ancillaries
- Differential pressure monitoring gauge.
- Float operated automatic drain trap.
- Electronic drain valve (for use with high quantities of water)

310.080 AIR RECEIVERS:
- Standard
- BS EN 286-1
- PD 5500
- Relevant parts of BS EN 13445
- Components
- Safety valve.
- Pressure gauge.
- Condensate drain cock.
- Inspection openings.
- Control pressure switch.
- Standby pressure switch.
- Automatic drain.
- Inlet isolating valves.
- Outlet isolating valves.
- Supporting feet.

- Matching flanges.
- Regulations - Comply with statutory regulations.

310.100 SAFETY VALVES:
- Standard
- Fit pop type valves to BS EN ISO 4126-1 and BS EN ISO 4126-7.
- Material
- Bronze bodies with bronze trim.
- Connections
- Male screwed bottom inlet.
- Male flanged bottom inlet.
- Female screwed side outlet.
- Female flanged side outlet.

310.150 SAFETY PRESSURE RELIEF VALVE:
- Safety valves to be in accordance with BS EN ISO 4126-1 and BS EN ISO 4126-7
- Install a safety pressure relief valve which actuates an audible alarm on downstream side of each pressure reducing valve.

310.160 PIPEWORK DISTRIBUTION SYSTEM:
- Material
- Aluminium to relevant parts of BS EN 755
- Sizes
- Jointing method
- Manufacturer's standard method.
- Components
- Pipework.
- Flexible pipework.
- Ball/isolating valve.
- Fixing plates.
- Support brackets.

310.165 FLEXIBLE PIPEWORK:
- Ensure flexible pipework for air is suitable for the pressures encountered and is not subjected to direct compression or tension during use.
- Install flexible pipework
- where indicated on drawings.

310.166 FLEXIBLE THERMOPLASTIC HOSES
- Flexible hoses to be textile-reinforced and in accordance with BS EN ISO 5774 and be suitable for the maximum working pressure / temperature of the system.
- Hoses to be complete with suitable and correctly fitted couplings and end fitted end fittings to form hose assemblies. End fittings to be either quick-release / quick acting type, screw threaded or socket and spigot type to suit the application.
- Install flexible hoses:
- At final connections to equipment.

310.180 PACKAGED UNITS:
- Duty
- Free air delivery (l/s) 16.66 (1000l/min)
- Working pressure (bar) 7.5
- Compressed air quality class to BS ISO 8573-1 2.4.2
- Electrical supply
- 3-ph, 415V, 50 Hz.
- Limiting overall sound pressure level in free field conditions (dBA) 62 at distance from machine (m) 1
- Components
- Compressor unit
- Rotary screw.

- Motor / drive
- Type Direct
- Installed motor power (kW) 7
- Efficiency
- Efficiency class - IE4
- Degree of protection in accordance with BS EN 60034-5
- IP55
- VSD (Variable speed drive)
- Control panel.
- After cooler and separator.
- Oil cooler.
- Fan.
- Instrument panel.
- Removable access panels.
- Oil reclaimer/separator.
- Oil filter.
- Anti-vibration mountings for compressor and motor.

310.190 INSTRUMENT AND CONTROL PANEL:
- Enclosure

House control panel and instruments in protective metal enclosure. Protection in accordance with BS EN 60529 IP Manufacturer's standard
- Functions

Start/stop button.
- Programme change.
- Output display
- Digital.
- Output information
- Discharge pressure.
- Intermediate pressure.
- Air temperature.
- Oil temperature.
- Filter condition - air.
- Filter condition - oil.
- Timed drainer intervals.

320.000 WORKMANSHIP

320.005 PIPEWORK DISTRIBUTION SYSTEM:
- Install pipework distribution system in positions indicated on drawings and in accordance with manufacturer's recommendations.
- Comply with HSG39 for compressed air safety.
- Comply with recommendations in latest edition of British Compressed Air Society (BCAS) guide to the selection and installation of compressed air services.
- Carry out pneumatic leak test followed by pneumatic pressure test as described in TR/6 Site pressure testing of pipework. Building Engineering Services Association. Guide to Good Practice.

320.010 COMPRESSOR AND ASSOCIATED EQUIPMENT:
- Install compressor and associated equipment in positions indicated on drawings and in accordance with manufacturer's recommendations and recommendations in the latest edition of British Compressed Gas Society (BCAS) guide to the selection and installation of compressed air services.

320.020 VALVES AND SAFETY DEVICES GENERAL:
- Mount vents, safety valves and fusible plugs so that they discharge safely. Comply with the manufacturer's installation and commissioning requirements.
- Provide safety valves in accordance with BS EN ISO 4126-1 and BS EN ISO 4126-7 and fusible plugs in accordance with BS 1123.
- Install safety devices in accordance with BS ISO 4126-9.

320.030 PIPEWORK:
- Install pipework between receivers and associated engines to allow moisture in pipes to run back into receiver. Fit moisture traps at low points in the system.
- Ensure joints and valves are accessible for maintenance purposes.

320.040 SAFETY REQUIREMENTS:
- Comply with BS EN 1012-1 for air compressors safety requirements.
- Comply with general rules and safety requirements for pneumatic fluid power systems and their components in accordance with BS EN ISO 4414 and BS EN ISO 12100.
- Comply with HSG39 for compressed air safety.
- For compressors used in potentially explosive atmospheres comply with relevant parts of BS EN 60079.
- Safety devices
- High air discharge temperature lock out switch.
- Cooling water failure lock out switch.
- Low oil pressure cut out.

320.060 DRIP TRAYS:
- Provide drip trays under compressor sets, allow removal for cleaning purposes.

320.070 GUARDS:
- Fit guards
- in accordance with BS EN ISO 12100.
- so that it is impossible to touch a moving part.
- Provide cover plates sized to allow inspections and adjustments to be made. Hold the cover plates in position with spring clips.

BS APPENDIX

BS 476-20:1987
Fire tests on building materials and structures. Part 20 Method for determination of the fire resistance of elements of construction (general principles)

BS 1123:2006
Fusible plugs for steam boilers and compressed air applications. Specification

BS EN 755-1:2016
Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Part 1 Technical conditions for inspection and delivery

BS EN 755-2:2016
Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Part 2 Mechanical properties

BS EN 755-3:2008
Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Part 3 Round bars, tolerances on dimensions and form

BS EN 755-4:2008
Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Part 4 Square bars, tolerances on dimensions and form

BS EN 755-5:2008
Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Part 5 Rectangular bars, tolerances on dimensions and form

BS EN 755-6:2008

Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Part 6 Hexagonal bars, tolerances on dimensions and form

BS EN 755-7:2016
Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Part 7 Seamless tubes, tolerances on dimensions and form

BS EN 755-8:2016
Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Part 8 Porthole tubes, tolerances on dimensions and form

BS EN 755-9:2016
Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Part 9 Profiles, tolerances on dimensions and form

BS EN 1012-1:2010
Compressors and vacuum pumps. Safety requirements. Air compressors

BS EN 60034-5:2001, IEC 60034-5:2000
Rotating electrical machines. Part 5 Degrees of protection provided by the integral design of rotating electrical machines (IP code). Classification

BS EN 60529:1992+A2:2013
Degrees of protection provided by enclosures (IP code)

BS EN ISO 2151:2008
Acoustics. Noise test code for compressors and vacuum pumps. Engineering method (Grade 2)

BS EN ISO 4126-1:2013+A2:2019
Safety devices for protection against excessive pressure. Part 1 Safety valves

BS EN ISO 4126-4:2013
Safety devices for protection against excessive pressure. Pilot-operated safety valves

BS EN ISO 4126-7:2013+A1:2016
Safety devices for protection against excessive pressure. Common data

BS EN ISO 4414:2010
Pneumatic fluid power. General rules and safety requirements for systems and their components

BS EN ISO 5774:2016
Plastic hoses. Textile-reinforced types for compressed-air applications. Specification.

BS EN ISO 16032:2004
Acoustics. Measurement of sound pressure level from service equipment in buildings. Engineering method

BS ISO 1217:2009+A1:2016
Displacement compressors. Acceptance tests

BS ISO 5782-1:2017
Pneumatic fluid power. Compressed air filters. Main characteristics to be included in supplier's literature and product-marking requirements

BS ISO 5782-2:1997
Pneumatic fluid power. Compressed air filters. Test methods to determine the main characteristics to be included in supplier's literature

BS ISO 6301-1:2017

Pneumatic fluid power. Compressed-air lubricators. Main characteristics to be included in supplier's literature and product-marking requirements

BS ISO 6301-2:2018
Pneumatic fluid power. Compressed air lubricators. Test methods to determine the main characteristics to be included in supplier's literature

BS ISO 8573-1:2010
Compressed air. Contaminants and purity classes

BS ISO 8573-1:2010
Compressed air. Contaminants and purity classes

BS ISO 8573-2:2018
Compressed air. Contaminant measurement. Oil aerosol content

BS ISO 8573-3:1999
Compressed air. Test methods for measurement of humidity

BS ISO 8573-4:2019
Compressed air. Contaminant measurement. Particle content

BS ISO 8573-5:2001
Compressed air. Test methods for oil vapour and organic solvent content

BS ISO 8573-6:2003
Compressed air. Test methods for gaseous contaminant content

BS ISO 8573-8:2004
Compressed air. Test methods for solid particle content by mass concentration

BS ISO 8573-9:2004
Compressed air. Test methods for liquid water content

BS ISO 12500-1:2007
Filters for compressed air. Test methods. Oil aerosols

BS ISO 12500-2:2007
Filters for compressed air. Test methods. Oil vapours

BS ISO 12500-3:2009
Filters for compressed air. Test methods. Particulates

BS ISO 12500-4:2009
Filters for compressed air. Methods of test. Water CD-ROM

S32 NATURAL GAS

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES:
Supply, install, commission and set to work a natural gas distribution network and ancillaries to the site to feed gas fired appliances as indicated within the specifications and at adequate pressures as per manufacturer's requirements and in accordance with the Gas Regulations.

100.020 DESIGN PARAMETERS:
The installation shall be in accordance with the relevant publications as listed below (but not limited to):

- Institute of Gas Engineers and Managers (IGEM) gas regulations
- Health and Safety Executive (HSE) publications
- The Gas Safety (Installation and Use) Regulations 1998. Approved Code of Practice and guidance (fifth edition, 2018).
- The Gas (Meters) Regulations 1983 (as amended)
- The Measuring Instruments Regulations 2016, SI 1153
- Relevant British Standards documentation

100.030 SYSTEM DESCRIPTION:

Incoming Supply and Distribution

A new 63mm dia (PE) incoming low pressure gas supply will be provided as part of the shell and core installation to an external meter box located externally to the plant area terminating at an emergency control valve (ECV). From the external meter position the Contractor shall extend the supply into the plant area to serve the gas fired boiler plant as indicated on the drawings. A gas solenoid valve and gas safety panel (as described below) shall be installed to meet the gas regulations.

The utility meter will be supplied and installed by the Client's nominated shipper.

Pipework

The internal distribution pipe work shall be installed in painted (BS 1710: Yellow ochre) made of black carbon steel. Pipework up to 50mm shall be welded or screwed with pipework 65mm and above welded and flanged. The Contractor may offer an alternative to the above for consideration.

Each branch supply to the boilers shall incorporate a flexible connection. In addition a purge point shall be installed at the end of the gas main after its final connection take-off.

Where distribution is run in ceiling voids, pipework shall be run as pipe-in-pipe or the ceiling void ventilated to meet the requirements of the gas regulations. **Note: It is has been assumed that within the plant area the pipework shall distribute below the fire rate ceiling.**

The Contractor shall ensure all required isolation, markings and electrical bonding of gas supply is in place.

The complete gas installation including requirements for void ventilation, appliance connections, warning notices, purge points and system schematic drawings shall be provided in accordance with current gas regulations.

Where pipework exits walls, floors or ceilings the Contractor shall provide chromium plated brass split masking plates.

Valves

An emergency gas solenoid valve, linked to the gas safety system shall be installed on the entry point

to the building and shall be closed as described in the relevant section.

The Contractor shall install valves to ensure that the system and ancillary items are maintainable, fully operable and commissionable.

Gas Safety Systems

Plant Room
A gas safety system shall be provided in accordance with IGEM/UP/11 in order to operate the gas solenoid valve located in the plant room.

A new safety panel (as Flamefast Boilerguard or equal and approved) shall be provided adjacent to the entrance of each plant room.

The system shall be provided with:

- CO monitoring
- Gas leak detection
- Emergency shut off button
- Fire alarm interface (with fire alarm test override)

Interlock the gas safety system with the BMS to ensure that boilers and other gas devices with automatic start are prevented from starting until the gas is live.

The Contractor shall ensure that the status of the valve is indicated to its associated control panel, even on power failure.

The unit shall be interlocked with the kitchen ventilation system and automatically shut-off under failure of the ventilation system.

Following shut-off of the valve; interlock the gas safety system with the BMS to ensure that opening of the gas solenoid valve is prevented from starting until the ventilation system is proven.

The Contractor shall ensure that the status of the valve is indicated to its associated control panel, even on power failure.

100.040 CONTROL REQUIREMENTS:
Refer to PMTC-SDP-XX-XX-SP-M-002 ‘Controls Specification’ for further details

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS
Refer to PMTC-XX-XX-SP-M-003 ‘Y Sections’ for reference specifications

PART 3 SPECIFICATION CLAUSES SPECIFIC TO S32
300.000 GENERAL

300.001 PRESSURE EQUIPMENT DIRECTIVE/PRESSURE EQUIPMENT REGULATIONS:
• All equipment and assemblies which fall within the scope of the Pressure Equipment Directive (PED) 2014/68/EU, implemented in the UK through the Pressure Equipment (Amendment) Regulations 2015 and The Pressure Equipment (Safety) Regulations 2016, must be tested by the manufacturers, and be certified as compliant with the Directive. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies.
• Only relevant equipment and assemblies (i.e. those with a maximum allowable) certified as compliant shall be permitted under this specification, and any substitution put forward must also be compliant with the Directive.

300.010 REGULATIONS:
• Supply and install equipment in accordance with
• HSE L56 Safety in the Installation and Use of Gas Systems and Appliances: Gas Safety (Installation and Use) Regulations 1998. Approved Code of Practice and guidance (fifth edition, 2018).
• HSE L81 - Design, construction and installation of gas services pipes. Pipelines Safety Regulations 1996, Approved Code of Practice and guidance.

- HSE L138 Dangerous substances and explosive atmospheres. Dangerous Substances and Explosive Atmospheres Regulations 2002. ACOP and guidance (second edition, 2013).
- The Gas (Meters) Regulations 1983 as amended.
- The Measuring Instruments Regulations 2016, SI 1153.

300.020 STANDARDS:
- Install in accordance with the following as appropriate to the application:
- Install gas pipework in buildings in accordance with BS EN 1775
- Supply and install gas infrastructure supply pipelines (mainly below ground) up to the building for maximum operating pressure up to and including 16 bar to BS EN 12007-1
- Polyethylene - BS EN 12007-2
- Service line from gas main branch saddle to the outlet from the distribution system operator's point of delivery to BS EN 12007-5
- Installation of gas fired catering appliances for use in all types of catering establishments to BS 6173.
- Gas supply pipelines for maximum operating pressure over 16 bar to BS EN 1594
- Gas pressure regulating installations on service lines to BS EN 12279
- Safety and control devices for gas-burners and gas-burning appliances - general requirements to BS EN 13611
- Gas infrastructure - gas installation pipework for operating pressure greater than 0.5 bar (industrial) and 5 bar (industrial and non-industrial) installations to BS EN 15001-1
- HSE L56 Safety in the Installation and Use of Gas Systems and Appliances: Gas Safety (Installation and Use) Regulations 1998. Approved Code of Practice and guidance (fifth edition, 2018).
- HSE L81 - Design, construction and installation of gas services pipes. Pipelines Safety Regulations 1996, Approved Code of Practice and guidance.
- IGEM/TD/3 Steel and PE pipelines for gas distribution
- IGE/TD/4 PE and steel gas services and service pipework
- IGE/UP/1 Strength testing, tightness testing and purging of industrial and commercial gas installations
- IGEM/UP/2 Installation pipework on industrial and commercial premises
- IGEM/UP/4 Commissioning of gas fired plant on industrial and commercial premises
- IGEM/UP/10 Installation of flued gas appliances in industrial and commercial premises
- IGEM/UP/11 Gas installations for educational establishments
- IGEM/UP/12 Application of burners and controls to gas fired process plant
- IGEM/UP/16 Design for natural gas installations on industrial and commercial premises with respect to hazardous area classification and preparation of risk assessments.
- IGEM/UP/19 Design and application of interlock devices and associated systems used with gas appliance installations in commercial catering establishments.
- IGE/GM/4 Flow metering practices. Inlet pressure exceeding 38 bar and not exceeding 100 bar
- IGEM/GM/5 Electronic gas volume conversion systems
- IGEM/GM/6 Non-domestic meter installations. Standard designs
- IGEM/GM/7A Electrical connections for gas metering equipment
- IGEM/GM/7B Hazardous area classification for gas metering equipment
- IGE/GM/8 Part 1, Non domestic gas meter installations. Flow rate exceeding 6m3/h and inlet pressure not exceeding 38 bar
- IGEM/G/5 Gas installations in multi-occupancy buildings
- Building Engineering Services Association (BESA) TR 20/9 Installation and Testing of Pipework Systems, Part Nine Natural Gas.
- Buried external incoming supply and distribution pipework systems (comprising pipe, fittings, valves and ancillaries)
- Polyethylene to BS EN 1555 (Parts 1 - 5)
- Polyethylene to BS ISO 4437 (Parts 1 - 5)
- Polyethylene to Gas Industry Standards
- Pipe - GIS/PL2-2 (up to 5.5 bar)
- Pipe - GIS/PL2-8 (up to 7 bar)
- Fittings - GIS/PL2-4 and GIS/PL2-6 and GIS/PL3 for self-anchoring mechanical fittings.
- Valves and ancillaries - GIS/V7-2 (Plastic bodied) or GIS/V7-3 (distribution brass valves)

310.000 PRODUCTS/MATERIALS

310.020 GAS PRESSURE REGULATORS:
- Standard
- For inlet pressures up to and including 50kPa, BS EN 88-1 and BS EN 13611.
- Regulator type
- Direct
- Indirect
- Adjustable pressure
- Class of pressure regulator
- Class A
- Class B
- Class C
- Filter.
- Regulator with limited relief valve and over pressure cut off.

310.030 AUTOMATIC SHUT OFF VALVES:
- Pipework Integrity Systems (or weep by-pass pressure proving systems) to be in accordance with IGEM/UP/2 Edition 3, Appendix 12.
- All valves shall conform to BS EN 161, class A, and relevant sections of BS EN 13611
- Electrical
- 230V.
- Degree of protection to BS EN 60529: IP54.
- Plant rooms:
- Provide an automatic shut-off valve with 24hr battery back up to all plant rooms. The valve shall be installed downstream of the manual emergency control valve at gas entry to the plant room. The valve shall be hard wired and closure shall be by operation of either a thermal link located above each burner, or one of the push buttons located at each exit from the plant room. Operation of the valve shall raise an alarm. The valve shall be manual reset.
- Standard - BS 6173
- Provide an automatic shut-off valve with 24hr battery back up and shielded emergency stop button, installed in the gas supply to any catering equipment. The stop button shall be readily accessible, near to the exit from the catering area. The valve shall be interlocked with the ventilation to the kitchens (such that the ventilation system operation must be proved before the gas service can be opened by air flow switches).
- Where catering appliances are not fitted with full flame safeguards, the gas supply shall also be fitted with a weep by-pass pressure proving system to prove closure of all valves prior to establishment or restoration of the gas supply. The system shall be in accordance with Appendix 12 of IGEM/UP2 Edition 3.
- At all locations where either a manual gas isolation valve is fitted, or where an automatic gas valve system can be reset, a notice shall be affixed stating:
- IN THE EVENT OF AN EMERGENCY THE GAS ISOLATION VALVE MUST BE CLOSED. ALL DOWNSTREAM BURNERS AND PILOT VALVES ON APPLIANCES MUST BE TURNED OFF PRIOR TO ATTEMPTING TO RESTORE THE GAS SUPPLY. AFTER EXTENDED SHUT-OFF, PURGE BEFORE RESTORING GAS SUPPLY.
- Educational establishments:
- Install an automatic means of isolating and restoring the gas supply to each teaching area. Install in accordance with IGEM/UP/11 (Gas installations for educational establishments). These are required as it is impractical to locate a manual gas isolation valve in a readily accessible position at the exits.
- In the event of a shut-down occurring, the system shall require manual resetting. In addition, the system shall perform an automatic check to prove that all downstream gas isolation valves are closed before the automatic valve is re-opened by the use of a weep by-pass pressure proving system in accordance with Appendix 12 of IGEM/UP/2 Edition 3.
- Valve type
- 2 way safety shut off valve solenoid actuated.

310.035 GAS SAFETY INTERLOCK SYSTEMS:
- Standard

• BS 6173
• Comply with IGEM/UP/19 for the design and application of interlock devices and associated systems used with gas appliances installations in commercial catering establishments.
• Scope
• Control panel, pressure switch or sensing device, gas isolation control valve.
• Supply and install interlock system in accordance with the manufacturer's recommendations. reference.
• Interlock with fire detection system
• Interlock with gas detection system
• Where appliances do not have flame failure devices provide a pipework integrity system (formerly referred to as weep by-pass system) in accordance with Appendix 12 in IGEM/UP/2 Edition 3.

310.055 MANUALLY OPERATED VALVES FOR GAS INSTALLATIONS IN BUILDINGS:
• Comply with the requirements of IGEM/UP/2 Edition 3, for the selection and installation of manual valves for pipe section / plant isolation, buried below ground, by-pass and AECV (additional emergency control valve) applications in accordance with the following standards:
• BS EN 331 - ball valves
• BS EN 331 - taper plug valves
• BS EN 593 - butterfly valves
• BS EN 1984 - steel gate valves
• BS EN ISO 15761 - steel gate, globe and check valves not exceeding 100mm NB
• BS EN 12266-1 and BS EN 12266-2 - testing and test procedures for valves
• BS EN 13774 - gas valves for distribution systems up to 16 bar

310.080 GAS PRESSURE REGULATING INSTALLATIONS IN SERVICE LINES TO BUILDINGS:
• Application
• Design, materials, construction and testing / commissioning of gas pressure regulating station in service line to the building from the distribution main.
• Standard
• Gas pressure regulating installation forming part of service line to - BS EN 12279.
• Gas pressure regulators for inlet pressures up to 100bar to - BS EN 334.
• Regulator class / type
• Class 1 - operating range from -100C to 600C
• Class 2 - operating range from -200C to 600C
• IS - (integral strength type)
• DS - (differential strength type)
• Direct acting
• Pilot controlled

310.100 FLEXIBLE CONNECTIONS:
• Type
• Corrugated metal hose assembly for combustible gas.
• Standards
• BS EN 16617 and BS EN ISO 10380 for corrugated metal hose assemblies.
• Flexible hoses for catering appliance to be in accordance with BS 669-2.
• Metal hose assemblies for connection of domestic appliance to be in accordance with BS EN 14800.
• Fittings
• Must be part of the hose assembly.
• Installation
• In accordance with the manufacturer's instructions and BS 6501-1.

320.000 WORKMANSHIP

320.010 INSTALLATION:
• Install gas pipework and equipment on industrial and commercial premises in accordance with IGEM/UP/2 and manufacturer's recommendations.
• Comply with Building Engineering Services Association (BESA) TR 20/9 Natural Gas.
• Comply with IGEM/UP/10 and the equipment manufacturer's recommendations for the installation of

flued gas appliances in industrial and commercial premises.

320.020 TESTING AND PURGING:

- Comply with IGE/UP/1 Strength testing, tightness testing and direct purging of industrial and commercial gas installations.
- Comply with IGE/UP/1A Strength testing, tightness testing and direct purging of small, low pressure industrial and commercial gas installations. Applicable to systems having a volume not exceeding 1m3.
- Comply with IGEM/UP/1B: Tightness testing and direct purging (Domestic). Applicable to installations with a nominal bore not greater than 35mm, capacity through the primary meter not exceeding 16m3/h and a maximum installation volume of 0.035m3.
- Carry out pressure testing of gas infrastructure (external to buildings) in accordance with BS EN 12327.

320.030 COMPLETION/COMMISSIONING:

- Commission gas fired plant on industrial and commercial premises in accordance with IGEM/UP/4.
- Commission gas infrastructure (external to buildings) supply systems in accordance with BS EN 12327
- Undertake all completion procedures detailed in Section 17 of IGEM/UP/2 Edition 3, and provide pipework commissioning checklist based on Appendix 16 in IGEM/UP/2.
- Provide a scheme for inspection, testing and maintenance of the gas installation for inclusion in the O&M manuals to ensure continued integrity.

BS APPENDIX

BS 669-2:1997
Flexible hoses, end fittings and sockets for gas burning appliances. Specification for corrugated metallic flexible hoses, covers, end fittings and sockets for catering appliances burning 1st, 2nd and 3rd family gases

BS 746:2014
Specification for gas meter unions and adaptors

BS 6173:2009
Specification for installation and maintenance of gas-fired catering appliances for use in all types of catering establishments (2nd and 3rd family gases)

BS 6400-1:2016
Specification for installation, exchange, relocation, maintenance and removal of gas meters with a maximum capacity not exceeding 6 m3/h. Part 1 Low pressure (2nd family gases)

BS 6400-1:2016
Specification for installation, exchange, relocation, maintenance and removal of gas meters with a maximum capacity not exceeding 6 m3/h. Part 1 Low pressure (2nd family gases)

BS 6400-2:2006
Specification for installation, exchange, relocation and removal of gas meters with a maximum capacity not exceeding 6 m3/h. Part 2 Medium pressure (2nd family gases)

BS 6400-2:2006
Specification for installation, exchange, relocation and removal of gas meters with a maximum capacity not exceeding 6 m3/h. Part 2 Medium pressure (2nd family gases)

BS 6400-3:2007
Specification for installation, exchange, relocation and removal of gas meters with a maximum capacity not exceeding 6 m3/h. Part 3 Low and medium pressure (3rd family gases)

BS 6501-1:2004
Metal hose assemblies. Guidance on the construction and use of corrugated hose assemblies

BS 7291-1:2010
Thermoplastics pipes and fitting systems for hot and cold water for domestic purposes and heating installations in buildings. Part 1 general requirements

BS 7291-2:2010
Thermoplastics pipes and associated fittings for hot and cold water for domestic purposes and heating installations in buildings. Part 2 specification for polybutylene (PB) pipes and associated fittings

BS 7291-3:2010
Thermoplastics pipes and associated fittings for hot and cold water for domestic purposes and heating installations in buildings. Part 3 specification for cross-linked polyethylene (PE-X) pipes and associated fittings

BS 9999:2017
Fire safety in the design, management and use of buildings. Code of practice

BS EN 88-1:2011+A1:2016
Pressure regulators and associated safety devices for gas appliances. Pressure regulators for inlet pressures up to and including 50 kPa

BS EN 88-2:2007
Pressure regulators and associated safety devices for gas appliances. Part 2 Pressure regulators for inlet pressures above 500 mbar up to and including 5 bar

BS EN 161:2011+A3:2013
Automatic shut-off valves for gas burners and gas appliances

BS EN 331:2015
Manually operated ball valves and closed bottom taper plug valves for gas installations for buildings

BS EN 334:2005+A1:2009
Gas pressure regulators for inlet pressures up to 100 bar

BS EN 558:2017
Industrial valves. Face-to-face and centre-to-face dimensions of metal valves for use in flanged pipe systems. PN and Class designated valves

BS EN 593:2017
Industrial valves. Metallic butterfly valves for general purposes.

BS EN 736-1:2018
Valves. Terminology. Definition of types of valves

BS EN 736-2:2016
Valves. Terminology. Definition of components of valves

BS EN 1092-1:2018
Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 1 steel flanges

BS EN 1092-2:1997
Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 2 cast iron flanges

BS EN 1092-3:2003
Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 3 copper alloy flanges

BS EN 1092-4:2002
Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 4 aluminium alloy flanges

BS EN 1254-1:1998
Copper and copper alloys. Plumbing fittings. Part 1 fittings with ends for capillary soldering or capillary brazing to copper tubes.

BS EN 1254-2:1998
Copper and copper alloys. Plumbing fittings. Part 2 fittings with compression ends for use with copper tubes

BS EN 1254-3:1998
Copper and copper alloys. Plumbing fittings. Part 3 Fittings with compression ends for use with plastics pipes

BS EN 1359:2017
Gas meters. Diaphragm gas meters

BS EN 1366-3:2009
Fire resistance tests for service installations. Penetration seals

BS EN 1366-4:2006+A1:2010
Fire resistance tests for service installations. Linear joint seals

BS EN 1555-1:2010
Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE). Part 1 General

BS EN 1555-1:2010
Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE). Part 1 General

BS EN 1555-2:2010
Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE). Part 2 Pipes.

BS EN 1555-2:2010
Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE). Part 2 Pipes.

BS EN 1555-3:2010+A1:2012
Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE). Part 3 Fittings.

BS EN 1555-3:2010+A1:2012
Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE). Part 3 Fittings.

BS EN 1555-4:2011
Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE). Part 4 Valves

BS EN 1555-4:2011
Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE). Part 4 Valves

BS EN 1555-5:2010
Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE). Part 5 Fitness for purpose of the system.

BS EN 1555-5:2010
Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE). Part 5 Fitness for purpose of the system.

BS EN 1594:2013
Gas infrastructure. Pipelines for maximum operating pressure over 16 bar. Functional requirements

BS EN 1775:2007
Gas supply. Gas pipework for buildings. Maximum operating pressure less than or equal to 5 bar. Functional recommendations

BS EN 1984:2010
Industrial valves. Steel gate valves

BS EN 10225:2009
Weldable structural steels for fixed offshore structures. Technical delivery conditions

BS EN 10226-1:2004
Pipe threads where pressure tight joints are made on the threads. Taper external threads and parallel internal threads. Part 1 dimensions, tolerances and designation

BS EN 10226-2:2005
Pipe threads where pressure tight joints are made on the threads. Taper external threads and taper internal threads. Dimensions, tolerances and designation

BS EN 10226-3:2005
Pipes threads where pressure-tight joints are made on the threads. Verification by means of limit gauges

BS EN 10253-1:1999
Butt-welding pipe fittings. Part 1 Wrought carbon steel for general use and without specific inspection requirements

BS EN 10253-2:2007
Butt-welding pipe fittings. Part 2 Non alloy and ferritic alloy steels with specific inspection requirements

BS EN 10253-3:2008
Butt-welding pipe fittings. Wrought austenitic and austenitic-ferritic (duplex) stainless steels without specific inspection requirements

BS EN 10253-4:2008
Butt-welding pipe fittings. Wrought austenitic and austenitic-ferritic (duplex) stainless steels with specific inspection requirements

BS EN 10255:2004
Non-alloy steel tubes suitable for welding and threading. Technical delivery conditions

BS EN 12007-1:2012
Gas infrastructure. Pipelines for maximum operating pressure up to and including 16 bar. Part 1 General functional requirements

BS EN 12007-2:2012
Gas infrastructure. Pipelines for maximum operating pressure up to and including 16 bar. Part 2 Specific functional requirements for polyethylene (MOP up to and including 10 bar)

BS EN 12007-3:2015
Gas infrastructure. Pipelines for maximum operating pressure up to and including 16 bar. Specific functional requirements for steel

BS EN 12007-4:2012
Gas infrastructures. Pipelines for maximum operating pressure up to and including 16 bar. Part 4 Specific functional requirements for renovation

BS EN 12007-5:2014
Gas infrastructure. Pipelines for maximum operating pressure up to and including 16 bar. Service lines. Specific functional requirements

BS EN 12261:2018
Gas meters. Turbine gas meters

BS EN 12266-1:2012
Industrial valves. Testing of valves. Pressure tests, test procedures and acceptance criteria. Mandatory requirements

BS EN 12266-2:2012
Industrial valves. Testing of metallic valves. Tests, test procedures and acceptance criteria. Supplementary requirements

BS EN 12279:2000
Gas supply systems. Gas pressure regulating installations on service lines. Functional requirements

BS EN 12327:2012
Gas infrastructure. Pressure testing, commissioning and decommissioning procedures. Functional requirements

BS EN 12405-1:2018
Gas meters. Conversion devices. Volume conversion

BS EN 12405-2:2012
Gas meters. Conversion devices. Energy conversion

BS EN 12405-3:2015

Gas meters. Conversion devices. Flow computer

BS EN 12480:2018
Gas meters. Rotary displacement gas meters

BS EN 13476-1:2018
Plastics piping systems for non-pressure underground drainage and sewerage. Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE). Part 1 General requirements and performance characteristics

BS EN 13476-2:2018
Plastics piping systems for non-pressure underground drainage and sewerage. Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE). Specifications for pipes and fittings with smooth internal and external surface and the system, Type A

BS EN 13476-3:2018
Plastics piping systems for non-pressure underground drainage and sewerage. Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE). Part 3 Specifications for pipes and fittings with smooth internal and profiled external surface and the system, Type B

BS EN 13501-2:2016
Fire classification of construction products and building elements. Classification using data from fire resistance tests, excluding ventilation services

BS EN 13611:2015
Safety and control devices for burners and appliances burning gaseous and/or liquid fuels. General requirements

BS EN 13774:2013
Valves for gas distribution systems with maximum operating pressure less than or equal to 16 bar. Performance requirements

BS EN 14236:2018
Ultrasonic domestic gas meters

BS EN 14800:2007
Corrugated safety metal hose assemblies for the connection of domestic appliances using gaseous fuels

BS EN 15001-1:2009
Gas infrastructure. Gas installation pipework with an operating pressure greater than 0.5 bar for industrial installations and greater than 5 bar for industrial and non-industrial installations. Detailed functional requirements for design, materials, construction, inspection and testing

BS EN 16314:2013
Gas meters. Additional functionalities

BS EN 16617:2015
Pipework. Corrugated metal hose assemblies for combustible gas. Performance requirements, testing and marking

BS EN 16668:2016+A1:2018
Industrial valves. Requirements and testing for metallic valves as pressure accessories

BS EN 60529:1992+A2:2013
Degrees of protection provided by enclosures (IP code)

BS EN 80416-1:2009
Basic principles for graphical symbols for use on equipment. Part 1 Creation of symbol originals

BS EN 80416-2:2001
Basic principles for graphical symbols for use on equipment. Part 2 Form and use of arrows

BS EN 80416-3:2002+A1:2011
Basic principles for graphical symbols for use on equipment. Part 3 Guidelines for the application of graphical symbols

BS EN ISO 10380:2012
Pipework. Corrugated metal hoses and hose assemblies

BS EN ISO 15761:2002
Steel gate, globe and check valves for sizes DN 100 and smaller, for the petroleum and natural gas industries

BS EN ISO 17672:2016
Brazing. Filler metals

BS ISO 4437-1:2014
Plastic piping systems for the supply of gaseous fuels. Polyethylene (PE). General

BS ISO 4437-1:2014
Plastic piping systems for the supply of gaseous fuels. Polyethylene (PE). General

BS ISO 4437-2:2014
Plastic piping systems for the supply of gaseous fuels. Polyethylene (PE). Pipes

BS ISO 4437-2:2014
Plastic piping systems for the supply of gaseous fuels. Polyethylene (PE). Pipes

BS ISO 4437-3:2014
Plastic piping systems for the supply of gaseous fuels. Polyethylene (PE). Fittings

BS ISO 4437-3:2014
Plastic piping systems for the supply of gaseous fuels. Polyethylene (PE). Fittings

BS ISO 4437-4:2015
Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE). Valves

BS ISO 4437-5:2014
Plastic piping systems for the supply of gaseous fuels. Polyethylene (PE). Fitness for purpose of the system

BS ISO 4437-5:2014
Plastic piping systems for the supply of gaseous fuels. Polyethylene (PE). Fitness for purpose of the system

BS ISO 7005-1:2011
Pipe flanges. Part 1 Steel flanges for industrial and general service piping systems

T1 HEAT SOURCE

T10 GAS / OIL FIRED BOILERS

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES:
Supply, install, commission and set to work a natural gas fired condensing boiler system to meet the heating demand of the site in the dedicated naturally ventilated boiler room.

To ensure the system has sufficient capacity for heating under start-up conditions.

To provide a flue system in accordance with relevant British Standards.

100.020 DESIGN PARAMETERS:

LTHW Primary design flow temperature	80°C
LTHW Primary design return temperature	60°C
Boiler operating pressure	2 bar
Minimum individual boiler output	33.7kW (2no @ 67%)

100.030 SYSTEM DESCRIPTION:

<u>Boilers</u>

Two number gas fired, condensing, wall hung boilers, with proprietary frame, shunt pumps and pipework kit shall be installed in the plant room. In addition, as part of the boiler package, the installation shall be provided with a low loss header to separate the primary and secondary circuits.

Boilers shall be provided with manufacturer's proprietary boiler control (enabled via the BMS) for cascade control of the boilers to maximise the system efficiency.

The shunt pumps (provided as part of the boiler package), shall also be operated via the boiler controller.

The boilers shall be selected to ensure ease of installation and future maintenance.

Under normal operating conditions, the boilers shall emit a dry NOx emission level (measured at 0% excess O_2) of less than 40mg/kWh (space heating).

Condensing Gas Fired Boilers shall be suitable for operation on natural gas or manufactured gas as recommended by the appropriate regional Gas supplier, and shall be installed in accordance with the current Gas Safety Regulations.

Boilers and their firing equipment shall be fully modulating with pre-mix burners.

The boilers shall be complete with control and hand re-set high limit thermostats, fully automatic burner operation comprising electronic ignition, pilot assembly and flame failure device.

The boilers shall be suitable for an electrical supply of 240 volts, single phase, 50 Hz.

The boilers shall be provided with the following (but not limited to):

- standard accessories and mountings
- spring safety temperature and pressure relief valves (piped to low level for safe discharge)
- dial type glass pressure and temperature gauges
- boiler controls
- draw off cocks and hose connections
- valved flow and return circuits.

Flues

The boilers shall be provided with individual concentric flues for room sealed applications, with connections from the boiler as per the manufacturer's recommendations following route as indicated on the drawings, at high level on the facade, for discharge of combustion products to atmosphere in accordance with the Gas Regulations, relevant British Standards, the Clean Air Act and Local Environmental Health Officer requirements. The Contractor should note that the flues will be routed through the panel above the door and so must discharge at the required height above the door by rising from the point of exit to external. In addition, the flues terminations must be located a distance apart in accordance with the gas regulations.

The flues shall be a prefabricated flue system of single wall aluminium construction as per manufacturer's recommendations. The flue shall be suitable for the continuous firing temperatures of the boiler appliance and shall be suitable for the environment and application

The Contractor shall supply and install all brackets and supports required for the flue system as per the manufacturer's requirements.

Flues shall be installed in the horizontal with a minimum fall of 3° (or as manufacturer's information) to drain through to the condensate low point drain in the flue allowing the condensate to drain to the low level copper foul drain via a waterless trap.

Boiler Room Ventilation

A louvred door shall be provided to the plant room to provide natural ventilation to meet combustion requirements and temperature regulation in accordance with the gas regulations.

Pipework and Ancillaries

Refer to T31 LOW TEMPERATURE HOT WATER HEATING for details.

Condensate

Condensate from the gas fired boilers shall be routed to drain under gravity to level copper foul drain via a waterless trap and installed in white uPVC pipework.

100.040 CONTROL REQUIREMENTS:

The boiler controller provided with the heating boilers shall be able to control the firing of each boiler following an enable signal from the BMS. Operation of the boilers shall achieved via a pipework mounted LTHW secondary return temperature sensor provided as part of the boiler package.

The boiler cascade control shall be integral intelligence set to achieve maximum efficiency.

Ensure that on failure of the lead boiler, the lag boiler is enabled and a fault signal raised via the BMS and indicated on the MCCP.

Refer to PMTC-SDP-XX-XX-SP-M-002 'Controls Specification' for further details

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS
Refer to PMTC-XX-XX-SP-M-003 'Y Sections' for reference specifications

PART 3 SPECIFICATION CLAUSES SPECIFIC TO T10

300.000 GENERAL

300.001 PRESSURE EQUIPMENT DIRECTIVE/PRESSURE EQUIPMENT REGULATIONS:
- All equipment and assemblies which fall within the scope of the Pressure Equipment Directive (PED) 2014/68/EU, implemented in the UK through the Pressure Equipment (Amendment) Regulations 2015 and The Pressure Equipment (Safety) Regulations 2016, must be tested by the manufacturers, and be certified as compliant with the Directive. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies.
- Only relevant equipment and assemblies certified as compliant shall be permitted under this specification, and any substitution put forward must also be compliant with the Directive.

300.010 PERFORMANCE:
- Supply and install boiler, together with matched firing appliance, to meet required performance criteria.
- Where on site performance testing is specified or scheduled in the particular specification the thermal performance assessment of boilers for steam, hot water and high temperature heat transfer fluids is to be established in accordance with BS 845-1 (straightforward procedure for non-condensing boilers only).
- Where onsite performance testing is specified or scheduled in the particular specification the thermal performance assessment of boilers for steam, hot water and high temperature heat transfer fluids is to be established in accordance with BS 845-2. Comprehensive procedure.
- Thermal performance of low temperature hot water boilers with rated heat output up to 600kW to be in tested at the manufacturers works when connected to a test rig in accordance with BS 7190.

300.022 BOILER SELECTION CRITERIA (NEW BUILD):
- Boilers with a rated heat output up to 400kW to comply with EU Regulation 813/2013 with regard to ecodesign requirements.
- Boiler load to avoid oversizing
- Seasonal efficiencies
- Refer to boiler schedule or clauses for actual boiler efficiencies required.
- Achieve an overall Boiler Seasonal Efficiency better than the minimum given in the Non Domestic Building Services Compliance Guide to Part L2 of the Building Regulations.
- Dry NOx emissions measured at 0% excess O2
- Emissions not exceeding 40 mg/kWh. requirement

300.025 SAFETY OF WATER BASED HEATING SYSTEMS:
- For water based heating systems in buildings with a maximum operating temperature of up to 105°C, ensure safety arrangements in the system comply with Section 4.6 in BS EN 12828.
- Comply with Annexe E in BS EN 12828 for safety valves in heating systems in addition to the relevant product standards referred to in Y11.

300.030 SAFETY OF GAS FIRED HOT WATER BOILERS:
- Safety and performance of gas fired hot water boilers fitted with atmospheric burners, fan assisted atmospheric burners or fully premixed burners in accordance with BS EN 15502-1 and BS EN 15502-2-1 for appropriate types of boiler up to 1000kW input.
- Electrical safety and performance of gas fired space heating appliances in accordance with BS 5986.
- Boilers rated up to and including 70 kW
- Gas fired boiler installations in accordance with BS 6798.

310.000 PRODUCTS/MATERIALS

310.015 WALL-MOUNTED GAS FIRED CONDENSING HOT WATER BOILERS (DOMESTIC AND SMALL COMMERCIAL):
- Boiler
- Gas fired heating boiler standard
- BS EN 15502-1 general requirements for types B and C boilers.

• BS EN 15502-2-1 specific requirements for type B2, B3, B5 and type C (room sealed) boilers up to 1000kW input.
• BS EN 15502-2-2 specific requirements for type B1 boiler incorporating a draught diverter up to 70kW input.
• Heat exchanger
• Aluminium.
• Boiler mountings
• Fit boiler mountings in accordance with BS 759-1
• Fit boiler mountings in accordance with manufacturer's recommendations.
• Fit safety valves in accordance with BS EN ISO 4126-1
• Casing
• Ensure casing allows easy access for maintenance.
• Burners
• Burner type
• Atmospheric or natural draught.
• Gas burners
• Supply gas burner matched to boiler.
• Provide gas burners manufactured in accordance with
• BS EN 676
• BS ISO 22967
• BS EN 12067-2
• Burner controls
• Provide burner complete with controls fully wired.
• Operation
• Modulating.
• Burners to comply with the general requirements of BS EN 13611 and specific control standards for products from the list below, that are applicable to the burner type and application specified.
• Relevant parts of BS EN 60730 for automatic electrical controls
• BS EN 126 - multifunctional control (two or more controls and/or application one of which is a mechanical control)
• BS EN 88-1 - pressure regulators
• BS EN 161 - automatic shut-off valves up to 500kPa
• BS EN 298 - automatic burner control systems
• BS EN 125 - flame supervision devices
• BS EN 257 - mechanical thermostats
• BS EN 1106 - manually operated gas taps
• BS EN 1643 - valve proving systems for automatic shut-off valves
• BS EN 1854 - pressure sensing devices
• BS EN 12067-2 - gas/air ratio controls, electronic types
• BS EN 16304 - automatic vent valves
• BS EN 16340 - combustion product sensing devices
• BS EN 16830 - temperature control function and combustion product safety device
• Where no specific product standard is available for controls and control functions, comply with BS EN 14459 and BS EN 13611.
• Flues

310.030 SAFETY DEVICES FOR HOT WATER SYSTEMS:
• Standard
• Relevant parts of BS EN ISO 4126
• BS EN 1491 Expansion valves for pressures up to 10 bar.
• BS 6283-2 Temperature relief valves from pressures from 1 bar to 10 bar.
• BS EN 1490 Combined temperature and pressure relief valves from 1 bar to 10 bar.
• BS EN 1567 Water pressure reducing valves and combination water reducing valves up to 16 bar.

310.040 BOILERHOUSE INSTRUMENTATION AND CONTROLS:
• Supply and fix instrumentation to enable user to check usage and efficiency of boiler plant.
• Standard

- BS 779 Section 6.
- BS 855 Section 7.
- Time switches to BS EN 60730-2-7

310.070 PRESSURISATION AND EXPANSION PLANT:
- Standards
- Supply expansion vessels with built in diaphragm for sealed hot water heating systems in accordance with BS EN 13831. For applications where the vessel water temperature is normally outside the range of 5 °C to 70 °C the test methods in this standard shall be adapted in such a way that the test temperature corresponds to the temperature to which the diaphragm shall be subject during operation.
- Application, selection and installation of expansion vessels to be in accordance with BS 7074-2.
- Any design work to follow BS EN 12828.
- Plant type
- Diaphragm expansion vessel or vessels and break tank/pumping pressurisation unit, either packaged or with expansion vessels supplied loose. Break tank to be complete with type AF air gap to BS EN 14622.
- Use vessel with butyl bag.
- Accessories
- Safety valve.
- High pressure switch.
- Low pressure switch.

310.080 VENTILATION TO BOILER ROOMS:
- For equipment with rated output not exceeding 70kW comply with BS 5440-2 for ventilation to gas burner.
- For gas boilers of rated input between 70kW (net) and 1.8 MW (net) (2nd and 3rd family gases) comply with BS 6644.
- For gas fired boilers of rated input greater than 70kW (net) comply with IGEM/UP/10.
- Ventilate boiler room by
- Natural means

310.090 CHIMNEYS AND FLUES:
- Regulations
- Ensure chimney heights comply with the Clean Air Act, associated Regulations applicable to the project location and the Local Authority requirements as appropriate.
- Provide stainless steel twin wall insulated flues and fittings.
- Fabricate inner from 316 stainless steel tested to a minimum corrosion classification of V2 to BS EN 1856-1. Material thickness dependent on flue diameter and fuel maximum sulphur content.
- Fabricate outer from 304 stainless steel. Material thickness dependent on flue diameter.
- A flue specialist shall undertake the detail design and supply and install the boiler flues in accordance with the boiler manufacturer's requirements. Final flue design shall be in accordance with the flue specialist recommendations. The flue specialist shall provide test certification of independent testing to BS EN 1856-1.
- Insulation thickness shall be determined by flue specialist to give a touch temperature of less than 70°C or as scheduled.
- The chimney system components should carry a current CE Mark showing the classification of the product.
- For twin wall flues the inner to be fully welded for oil fired boilers and biomass boilers.
- Flues shall carry a relevant fire rating for the application and have a minimum V2 (or V3 for heavy oil) corrosion classification to BS EN 1856-1.
- Flues for condensing boilers shall include proprietary joint seals to ensure the system is pressure tight and moisture resistant and suitably drained.
- Drainage points should be added at the bottom of risers and also on horizontal runs over 6 meters.
- Standards
- Comply with BS EN 1443 for general requirements and basic performance criteria (excluding structurally independent chimneys).

• For gas appliances with outputs not exceeding 70kW comply with BS 5440-1 and BS EN 15287-1 (non-roomsealed appliances) or BS EN 15287-2 (roomsealed appliances).
• For flue structures serving appliances of 45 kW output and above within a space enclosed by a building or which is an integral part of the building comply with BS 5854.
• Supply single and multi wall metal system chimney up to 1200mm diameter in accordance with BS EN 1856-1 tested in accordance with the test methodology in BS EN 1859 and BS EN 13216 as appropriate.
• Supply metal flue liners and rigid connecting flue pipes and their fittings in accordance with BS EN 1856-2.
• Comply with requirements of BS EN 14989-2 for flue and air supply ducts for room sealed appliances.
• Comply with requirements and test method of BS EN 14989-1 for vertical terminals for type C6 appliances intended to be connected to a separately approved and marketed system for the supply of combustion air and discharge of the combustion products.
• Draught regulators, standstill opening devices (motorised) and combinations of draught regulator / standstill opening devices to BS EN 16475-3.
• Rain caps to BS EN 16475-7

310.110 BOILER ROOM FUEL SUPPLY SHUT DOWN AND ALARM FACILITIES:
• Provide stand-alone emergency fuel shut off system comprising
• Tight shut off valve where pipework enters the plant room. Size and location of valve given on drawings. Gas valve to be in accordance with BS EN 161 and relevant sections of BS EN 13611.
• Emergency shut off button at each plant room exit
• Control panel.
• Gas detector.
• Carbon Monoxide detector
• Fuel shut off valve
• Electrically operated solenoid fire valve
• Power supply
• 230V.
• Fire alarm system
• BMS
• Local alarms
• Audible.
• Visual.

320.000 WORKMANSHIP

320.010 INSTALLATION:
• Install all equipment on purpose made bases or supports, capable of carrying load of equipment.
• Comply with the manufacturer's installation instructions.
• Install all site constructed equipment to manufacturer's instructions.
• Ensure joints are pressure tested prior to installation of lagging and casings.
• Replace all damaged equipment, lagging and casings.

320.030 GAS BOILER INSTALLATION:
• Install gas boilers for space heating,
• Rated up to 70kW, in accordance with BS 6798.
• Rated between 70kW and 1.8MW in accordance with BS 6644
• Exceeding 70kW net heat input in industrial and commercial premises comply with IGEM/UP/10 Edition 4.

320.070 PRESSURISATION UNIT INSTALLATION:
• Install pressurisation unit and ancillary equipment in accordance with manufacturer's recommendations including safety valve.
• Install expansion vessels and ancillary equipment for low and medium temperature hot water heating systems including safety valve in accordance with BS 7074-2.
• Install expansion vessels for domestic heating and hot water supply in accordance with BS 7074-1.

- Install double check valves on quick fill connections.

BS APPENDIX

BS 759-1:1984
Valves, gauges and other safety fittings for application to boilers and to piping installations for and in connection with boilers. Part 1 Specification for valves, mountings and fittings

BS 779:1989
Specification for cast iron boilers for central heating and indirect hot water supply (rated output 44 kW and above).

BS 845-1:1987
Methods for assessing thermal performance of boilers for steam, hot water and high temperature heat transfer fluids. Concise procedure

BS 845-2:1987
Methods for assessing thermal performance of boilers for steam, hot water and high temperature heat transfer fluids. Comprehensive procedure

BS 855:1990
Specification for welded steel boilers for central heating and indirect hot water supply (rated output 44 kW to 3 MW).
Partially replaced by BS EN 303-1:1999 and BS EN 303-4:1999

BS 5440-1:2008
Flueing and ventilation for gas appliances of rated input not exceeding 70 kW net (1st, 2nd and 3rd family gases). Part 1 Specification for installation of gas appliances to chimneys and for maintenance of chimneys

BS 5440-2:2009
Flueing and ventilation for gas appliances of rated input not exceeding 70 kW net (1st, 2nd and 3rd family gases). Part 2 Specification for installation and maintenance of ventilation provision for gas appliances

BS 5854:1980
Code of practice for flues and flue structures in buildings

BS 5986:1980
Specification for electrical safety and performance of gas fired space heating appliances with inputs 60 kW to 2 MW

BS 6283-2:1991
Safety and control devices for use in hot water systems. Part 2 Specifications for temperature relief valves for pressures from 1 bar to 10 bar

BS 6644:2011
Specification for installation and maintenance of gas-fired hot water boilers of rated inputs between 70 kW (net) and 1.8 MW (net) (2nd and 3rd family gases)

BS 6798:2014
Specification for selection, installation, inspection, commissioning, servicing and maintenance of gas-fired boilers of rated input not exceeding 70 kW net

BS 6891:2015
Specification for the installation and maintenance of low pressure gas installation pipework of up to 35 mm (R1¼) on premises

BS 7074-1:1989
Application, selection and installation of expansion vessels and ancillary equipment for sealed water systems. Part 1 Code of practice for domestic heating and hot water supply

BS 7074-2:1989
Application, selection and installation of expansion vessels and ancillary equipment for sealed water systems. Part 2 Code of practice for low and medium temperature hot water heating systems

BS 7190:1989
Method for assessing thermal performance of low temperature hot water boilers using a test rig

BS EN 88-1:2011+A1:2016
Pressure regulators and associated safety devices for gas appliances. Pressure regulators for inlet pressures up to and including 50 kPa

BS EN 125:2010+A1:2015
Flame supervision devices for gas burning appliances. Thermoelectric flame supervision devices

BS EN 126:2012
Multifunctional controls for gas burning appliances

BS EN 161:2011+A3:2013
Automatic shut-off valves for gas burners and gas appliances

BS EN 257:2010
Mechanical thermostats for gas-burning appliances

BS EN 298:2012
Automatic burner control systems for burners and appliances burning gaseous or liquid fuels

BS EN 656:2000
Gas-fired central heating boilers. Type B boilers of nominal heat input exceeding 70 kW, but not exceeding 300 kW

BS EN 676:2003+A2:2008
Automatic forced draught burners for gaseous fuels.

BS EN 1106:2010
Manually operated taps for gas burning appliances

BS EN 1443:2003
Chimneys. General requirements

BS EN 1490:2000
Building valves. Combined temperature and pressure relief valves. Tests and requirements

BS EN 1491:2000
Building valves. Expansion valves. Tests and requirements

BS EN 1567:1999
Building valves. Water pressure reducing valves and combination water reducing valves. Requirements and tests

BS EN 1643:2014
Safety and control devices for gas burners and gas burning appliances. Valve proving systems for automatic shut-off valves

BS EN 1854:2010
Pressure sensing devices for gas burners and gas burning appliances

BS EN 1856-1:2009
Chimneys. Requirements for metal chimneys. Part 1 System chimney products

BS EN 1856-2:2009
Chimneys. Requirements for metal chimneys. Part 2 Metal flue liners and connecting flue pipes

BS EN 1859:2009+A1:2013
Chimneys. Metal chimneys. Test methods

BS EN 12067-2:2004
Gas/air ratio controls for gas burners and gas burning appliances. Part 2 Electronic types

BS EN 12828:2012+A1:2014
Heating systems in buildings. Design for water-based heating systems

BS EN 13216-1:2004
Chimneys. Test methods for system chimneys. General test methods

BS EN 13611:2015
Safety and control devices for burners and appliances burning gaseous and/or liquid fuels. General requirements

BS EN 13831:2007
Closed expansion vessels with built-in diaphragm for installation in water

BS EN 14459:2015
Safety and control devices for burners and appliances burning gaseous or liquid fuels. Control functions in electronic systems. Methods for classification and assessment

BS EN 14622:2005
Devices to prevent pollution by backflow of potable water. Air gap with circular overflow (restricted). Family A, type F

BS EN 14989-1:2007
Chimneys. Requirements and test methods for metal chimneys and material independent air supply ducts for roomsealed heating applications. Part 1 Vertical air/flue terminals for C6-type appliances

BS EN 14989-2:2007
Chimneys. Requirements and test methods for metal chimneys and material independent air supply ducts for roomsealed heating applications. Part 2 Flue and air supply ducts for room sealed appliances

BS EN 15287-1:2007+A1:2010
Chimneys. Design, installation and commissioning of chimneys. Part 1 Chimneys for non-roomsealed heating appliances

BS EN 15287-2:2008
Chimneys. Design, installation and commissioning of chimneys. Chimneys for roomsealed appliances

BS EN 15502-1:2012+A1:2015
Gas-fired heating boilers. General requirements and tests

BS EN 15502-2-1:2012+A1:2016
Gas-fired central heating boilers. Specific standard for type C appliances and type B2, B3 and B5 appliances of a nominal heat input not exceeding 1 000 kW

BS EN 15502-2-2:2014
Gas-fired central heating boilers. Specific standard for type B1 appliances

BS EN 16304:2013

Automatic vent valves for gas burners and gas burning appliances

BS EN 16340:2014
Safety and control devices for burners and appliances burning gaseous or liquid fuels. Combustion product sensing devices

BS EN 16475-2:2017
Chimneys. Accessories. Chimney fans. Requirements and test methods

BS EN 16475-3:2016
Chimneys. Accessories. Draught regulators, standstill opening devices and combined secondary air devices. Requirements and test methods

BS EN 16475-7:2016
Chimneys. Accessories. Rain caps. Requirements and test methods

BS EN 16830:2017
Safety and control devices for burners and appliances burning gaseous or liquid fuels. Control functions in electronic systems. Temperature Control function

BS EN 60730-1:2016
Automatic electrical controls. Part 1 General requirements

BS EN 60730-2-3:2007
Specification for automatic electrical controls for household and similar use. Part 2-3 Particular requirements for thermal protectors for ballasts for tubular fluorescent lamps

BS EN 60730-2-4:2007
Automatic electrical controls for household and similar use. Particular requirements for thermal motor protectors for motor-compressors of hermetic and semi-hermetic type

BS EN 60730-2-5:2015
Automatic electrical controls. Particular requirements for automatic electrical burner control systems

BS EN 60730-2-5:2015
Automatic electrical controls. Particular requirements for automatic electrical burner control systems

BS EN 60730-2-6:2016
Automatic electrical controls. Particular requirements for automatic electrical pressure sensing controls including mechanical requirements

BS EN ISO 4126-1:2013+A1:2016
Safety devices for protection against excessive pressure. Part 1 Safety valves

BS EN ISO 4126-1:2013+A1:2016
Safety devices for protection against excessive pressure. Part 1 Safety valves

BS EN ISO 4126-2:2003
Safety devices for protection against excessive pressure. Bursting disc safety devices

BS EN ISO 4126-3:2006
Safety devices for protection against excessive pressure. Safety valves and bursting disc safety devices in combination

BS EN ISO 4126-4:2013
Safety devices for protection against excessive pressure. Pilot-operated safety valves

BS EN ISO 4126-5:2013+A1:2016
Safety devices for protection against excessive pressure. Controlled safety pressure relief systems (CSPRS)

BS EN ISO 4126-6:2014
Safety devices for protection against excessive pressure. Application, selection and installation of bursting disc safety devices

BS EN ISO 4126-7:2013+A1:2016
Safety devices for protection against excessive pressure. Common data

BS EN ISO 4126-7:2013+A1:2016
Safety devices for protection against excessive pressure. Common data

BS EN ISO 4126-11
Safety devices for protection against excessive pressure. Performance testing

BS ISO 22967:2010
Forced draught gas burners

T3 HEAT DISTRIBUTION / UTILISATION - WATER

T31 LOW TEMPERATURE HOT WATER HEATING

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES:
Supply, install test and commission a complete LTHW system in accordance with this specification.

To ensure all necessary control valves and ancillaries are installed required to operate the variable flow, constant temperature (CT) and variable temperature (VT) circuits in an efficient manner.

100.020 DESIGN PARAMETERS:

Secondary LTHW CT design flow temperature	80°C
Secondary LTHW CT design return temperature	60°C
Secondary LTHW VT design flow temperature	80°C @ -3°C external temperature 20°C @ 20°C external temperature
Secondary LTHW VT design return temperature	60°C @ -3°C external temperature 20°C @ 20°C external temperature
System maximum design temperature	90°C
System maximum operating pressure	6 bar
External heating design temperature	-3°C

For room temperatures/acoustic requirements refer to APPENDIX A – COMMON DESIGN CRITERIA

100.030 SYSTEM DESCRIPTION:
The LTHW heating system shall consist of a primary circuit separated from the secondary circuit via a low loss header (supplied as part of the boiler package). The secondary circuits shall consist of constant temperature (CT) and variable temperature (VT) flow and return circuits which shall distribute from the plant room around the building at each floor within the ceiling voids and risers to serve emitters to meet the heat demands of the site.

Heating and emitters shall be sized to off-set fabric and fresh air losses with pipework and emitters oversized by 20% (as per CIBSE recommendations) to allow for cold start up.

The system shall be a variable volume system with pumping speed controlled via operation of Motorised Valves (MVs) and Thermostatic Radiator Valves (TRVs) installed to control flow through the emitter of group of emitters to give optimum control and energy saving.

<u>Primary/Secondary Circuits</u>

The primary and secondary circuit shall be separated via low loss header (supplied as part of the boiler package).

The secondary VT circuit shall be a weather compensated circuit via means of a 3-port mixing valve and shall serve radiators as indicated on the drawings.

The secondary CT circuit shall serve radiant panels with the composites room, fan convectors within the CNC room as well as the HWS calorifier located within the plant room.

Routing of internal heating pipe work shall be co-ordinated with the building appearance and installed in a neat and presentable fashion in areas where exposed and on show. The pipework at ground and first floor shall be routed within the ceiling void where suspeneded ceilings are present.

<u>Emitters</u>

The building shall be heated using a combination of LTHW heating methods as indicated on the drawings and described below:

Radiators

Rooms and corridor areas as indicated on the drawings shall be heated using traditional steel panel radiators.

All radiators shall be supplied with manufacturers matched standard fixing brackets, complete with any secondary supports necessary and fixed using rawlbolt fixings. Each radiator shall be provided with lockshield valves on the flow and return.

Control of the radiator output shall be via TRV's on the flow with matching lockshield on the return with the exception of the radiators within the landing area where the room sensor for control of temperatures will be located.

Fan Convector Unit Heaters

The CNC room shall be served by 1No. wall mounted fan convector units. The units shall be selected at low fan speed to meet the acoustic criteria of the space.

The units shall be provided with local room sensor and controller (specified touchscreen controller as SPC Modulo or equal and approved) for operation by the occupants. The controller shall be capable of taking a signal from the BMS for enable/disable of the units. All units shall be provided with provided with EC motors and 2 port control valves or TRVs as standard.

Radiant Panels

Ceiling mounted LTHW radiant panels shall be installed to serve the Composites Room. Radiant panels shall be selected to achieve a maximum Radiant Temperature Asymmetry (RTA) of 5K

The panels shall be constructed from either a minimum 2mm thick cold reduced steel sheet or extruded aluminium alloy, each panel shall be RAL colour to match ceiling finish. All final connections to each panel shall be either capillary or compression (not push fit).

Each panel shall have its own continuous pipe coil manufactured from copper tube to BS EN 1057, and pressure tested to a minimum 7 Bar (G) at 90°C.

Each panel shall be complete with manufacturer's standard insulation with Class 'O' reinforced heat reflecting metal foil.

The panels shall be controlled via a 2-port valve arrangement on the flow with a remote wall mounted BMS black-bulb sensor and local controller (with set point and timeclock adjustment) in the associated space as indicated on the drawings.

Pumps

The heating pumps shall be installed within the dedicated plant rooms. This equipment shall comply with the latest European legislation relating to mains borne interference/harmonise and the isolation of the same. The equipment shall be CE certified.

Single head, pump sets with integral variable speed drives and differential pressure switches shall be installed on the secondary circuits to distribute LTHW CT and VT around the system.

The units shall operate in conjunction with 2 port control valves and TRVs with integral differential pressure controls to allow the pumped water volume to vary according to actual demand.

The pumps shall have an accompanying user interface control to assist with commissioning and monitoring.

The Client shall be provided at handover with 1 No. handheld controller for the pumps.

Pressurisation and Expansion

The Contractor shall supply and install a pumpless pressurisation units with quick fill capability and expansion vessel to serve the LTHW installation monitored via the BMS for fault.

Air Removal/Dirt Separation/Dosing

A combined air/dirt separator and manual dosing pot 'X-pot' type unit shall be installed as per manufacturer's recommendations.

Expansion and Contraction

Due allowance shall be allowed for expansion and contraction. This shall be in the form of loops, bellows, anchors, guides, offsets, rollers/chairs and cold draw. Wherever feasible; natural flexibility solutions shall be employed. All provisions for expansion and contraction shall be indicated on the fabrication drawings submitted with the supporting calculations to the Engineer for comment prior to installation taking place.

In the event that natural flexibility cannot be used due to building fabric restraints, bellows shall be installed which shall be multi-layered stainless steel (316L) quality units.

Strainers

New strainers shall be installed on the feed to all the secondary pumps. These shall be provided with pressure gauges before and after to aid with maintenance.

Pipework

Heavy grade carbon steel pipework shall be provided as the design specification within the boiler room where new pipe work is to be provided.

The Contractor shall be responsible for the design and installation of supports, brackets and hangers.

Pipe work shall be installed to facilitate draining and venting with drain points at all low points and air vents at all high points.

Fittings are to be inspected and tested before being concealed.

Where pipework exits walls, floors or ceilings the Contractor shall provide chromium plated brass split masking plates.

Control Valves

The desired temperature of the weather compensated VT circuit shall be achieved via a 3-port mixing valve as indicated on the drawings.

The HWS calorifier shall be supplied with a 2-port motorised to operate via temparture sensors measuring the stored hot water.

A 3-port summer bypass diverting valve shall be provided on the CT circuit so that when heating is not required, the pump minimum flow can be accommodated.

Valves

The Contractor shall install all valves to ensure that the system and ancillary items are maintainable, fully operable and commissionable.

TRVs shall be suitable for the differential pressure imposed by the circulation pumps.

Constant Flow Valves

Pressure independent constant flow valves shall be provided in the system suitable for a variable volume system to ensure pump minimum flow is achieved when required.

Gauges

The Contractor shall install temperature gauges in the primary and secondary circuits on the flow and return sides and pressure gauges either sides of pumps and strainers.

Insulation

New thermal insulation shall be provided thought all blocks for the following pipework and in accordance with this Specification. All insulation shall be green guide cat A+ or A complaint serving the following (but not limited to):

1. All pipe work and valves in plant rooms and tank rooms.
2. All pipe work and valves within ceiling voids and roof voids.
3. All pipe work and valves within the service voids and boxings.
4. All concealed pipe work and valves shall be insulated.
5. All thermal insulation shall pass through the pipe support clip, with a suitable load
6. bearing insert.
7. All locations where there is a risk of pipe contents freezing.
8. All locations where heat emitted from exposed pipes & valves may cause
9. overheating.
10. Valve boxes are to be provided in plant & tank rooms.
11. Valve bags and / or oversized insulation sections are acceptable elsewhere.

All heating system pipe work not used as useful heating surface shall be fully thermally insulated.

All pipework, flanges, valves and ancillaries shall be insulated in foil faced mineral wool.

In the boiler room the insulation shall be protected by an Aluminium cladding system

All LTHW pipework shall be cleaned to remove loose material and painted with anti-corrosion paint before insulation is applied.

Cleaning and Chemical Treatment

To enable water treatment to be maintained within the existing the new extended heating system shall be fully flushed, chemically cleaned and dosed to BSRIA Guide standards before being finally connected into the existing system. Initial test / dosing shall be completed prior to first application of heat and a second test / dosing shall take place immediately prior to the end of the defects period.

All water testing necessary to determine what level and type of treatment is to be provided shall be included.

100.040 CONTROL REQUIREMENTS:
A variable flow control strategy shall be adopted using a pump capable of variable flow control. A centrifugal pump with variable speed drive shall be used to match heat supply to demand.

Pumps
A variable flow control strategy shall be adopted using a pump capable of variable flow control. A centrifugal pump with variable speed drive shall be used to match heat supply to demand.

All pumps shall be enabled via the BMS and provide a fault signal to the BMS under failure and indicated on the MCCP.

Heat Meters

Heat meters shall be provided as indicated on the drawing to comply with the Building Regulations and in accordance CIBSE TM39.

A heat meter shall be installed on the secondary LTHW distribution from the plant room and the circuit to the HWS calorifier so that energy consumption for both heating and hot water generation can be obtained.

The heat meters shall be Measuring Instrument Directive (MID) accuracy 2 with output to the BMS. These meters shall be hard wired for power and data. The meters shall be installed with suitable isolation valves to allow removal for maintenance.

Heat meters are to be provided with integrator, sensors and interconnecting cables calibrated as a single unit at the manufacturer's works.

Installation to be in accordance with manufacturer details & commissioning to be carried out by manufacturer.

Sensors

An external temperature sensor for heating control shall be installed, ideally on a north facing wall of each building, in shade.

A room sensor shall be installed in the landing area to indicate internal building temperatures, and data shall be available to the BMS for control of LTHW VT temperature.

Temperature sensors shall be installed on each heating flow and return circuits as indicated on the drawings.

Weather compensation

The heating system shall modulate according to the weather compensation control and the heat curve set in the BMS system.

Refer to PMTC-SDP-XX-XX-SP-M-002 ‘Controls Specification’ for further details

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS
Refer to PMTC-XX-XX-SP-M-003 ‘Y Sections’ for reference specifications

PART 3 SPECIFICATION CLAUSES SPECIFIC TO T31

300.000 GENERAL

300.001 PRESSURE EQUIPMENT DIRECTIVE/PRESSURE EQUIPMENT REGULATIONS:
- All equipment and assemblies which fall within the scope of the Pressure Equipment Directive (PED) 2014/68/EU, implemented in the UK through the Pressure Equipment (Amendment) Regulations 2015 and The Pressure Equipment (Safety) Regulations 2016, must be tested by the manufacturers, and be certified as compliant with the Directive. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies.
- Only relevant equipment and assemblies certified as compliant shall be permitted under this specification, and any substitution put forward must also be compliant with the Directive.

300.010 SITE DIMENSIONS:
- Check dimensions on-site prior to ordering.

300.020 TESTING:
- Test at manufacturer's works to appropriate British Standard to suit pressure and temperature conditions of system.

300.025 SAFETY OF WATER BASED HEATING SYSTEMS:
- For water based heating systems in buildings with a maximum operating temperature of up to 105oC, ensure safety arrangements in the system comply with Section 4.6 in BS EN 12828.
- Comply with Annexe E in BS EN 12828 for safety valves in heating systems in addition to the relevant product standards referred to in Y11.

310.000 PRODUCTS/MATERIALS

310.020 RADIATORS, CONVECTORS AND TRENCH HEATING GENERALLY:
- Ensure heat emitters are manufactured to BS EN 442-1 and tested/rated in accordance with BS EN 442-2
- Ensure fan assisted radiators, convectors and trench heaters are manufactured to BS EN 16430-1 and tested/rated for thermal output in accordance with BS EN 16430-2

310.030 RADIATORS - STEEL PANEL:
- Manufacture in accordance with BS EN 442-1
- Radiators manufacturer's works.
- Air cock
- Provide return end air cock recessed within unit length.
- Finish
- Degrease and protect against rusting before application of a high quality stove primer, then powder coat with epoxy polyester.
- Testing
- Pressure test at not less than 7 bar (gauge) or one and a half times maximum working pressure, whichever is greater.
- Thermal output and pressure drop testing/rating to be in accordance with BS EN 442-2
- Accessories
- Wall brackets.

310.080 FAN CONVECTOR HEATERS:
- Type
- Ceiling-mounted low water content convector with heat exchanger manufactured from copper tubes with aluminium fins and fitted with fan or multiple fans to boost the convective thermal output.
- Standard
- Ensure fan assisted convectors equipped with fans to increase the convective thermal output are manufactured in accordance with BS EN 16430-1 and tested/rated for thermal output in accordance with BS EN 16430-2
- Ensure fan convector heaters are rated in accordance with BS 4856-1
- Arrangement
- Ceiling mounted
- Casing
- Manufacturer's standard. casing.
- Internal lining
- Line internal casing surfaces with fire retardant acoustic absorption material, free from surface erosion.
- Access
- Provide an easily removable panel to give access to fan, motor and filter.
- Finish
- Degrease and protect against rusting before providing corrosion protection by phosphating followed by powder coating.
- Heating elements
- Materials
- Finned tubes
- Steel.

- Copper.
- Fins
- Aluminium.
- Copper.
- Steel.
- Connections
- Screwed female to relevant parts of BS EN 10226, terminating within casing.
- Air cock
- Fit an air cock on flow connection with the air cock terminating
- Fan
- Crossflow centrifugal with EC motor.
- Motor
- Electronically commutated (EC) with infinitely variable speed control.
- Electrical supply to BS EN 60038
- Single-phase.
- Vibration isolation
- Isolate motor/fan assembly from casing by anti-vibration mountings.
- Filter
- Removable, washable type.
- Grilles
- Linear grilles to manufacturer's standard.
- Controls
- Pre-wired sensors / controls arranged for
- Automatic fan speed control.
- Remote stop / start from BMS.
- Testing
- Pressure test at not less than 7 bar (gauge) or one and a half times maximum working pressure, whichever is greater.

310.100 RADIANT PANELS:
- BS EN 14037-2 - test methods for thermal output.
- BS EN 14037-3 - rating method and evaluation of thermal output.
- Material
- Coil and Header, coil minimum diameter 20mm and header minimum diameter 32mm
- Heavy grade mild steel.
- Copper.
- Front panel
- Material
- Aluminium.
- Finish
- Powder Coated
- Insulation
- Insulate back of panel with 40mm minimum thickness material.
- Air venting
- Provide air cock for venting in unit header.
- Access
- Provide access panel to match front plate.
- Support
- Provide adjustable hangers for ceiling suspension.

320.000 WORKMANSHIP

320.010 INSTALLATION:
- Install in accordance with manufacturer's recommendations to give a neat appearance, with supports out of view where possible. Ensure equipment is firmly fixed and level.
- Install forced circulation hot water central heating systems for domestic premises, including domestic hot water with heat requirements up to a total of 50kW to BS EN 14336

320.020 BUILDERSWORK:
- Mark out positions for battens fixed by others, when fixing equipment to stud walling.

320.030 SECOND FIX:
- Allow for removal and second fix of
- radiators.

320.040 ISOLATION:
- Fit an isolating valve on flow and a regulating valve on return unless otherwise indicated.

BS APPENDIX

BS 476-3:2004
Fire tests on building materials and structures. Part 3 Classification and method of test for external fire exposure to roofs

BS 476-4:1970
Fire tests on building materials and structures. Part 4 Non-combustibility test for materials

BS 476-6:1989+A1:2009
Fire tests on building materials and structures. Part 6 Method of test for fire propagation for products

BS 476-7:1997
Fire tests on building materials and structures. Part 7 Method of test to determine the classification of the surface spread of flame of products

BS 476-10:2009
Fire tests on building materials and structures. Part 10 Guide to principles, selection, role and application of fire testing and their outputs

BS 476-11:1982
Fire tests on the building materials and structures. Part 11 Method for assessing the heat emission from building materials

BS 476-12:1991
Fire tests on building materials and structures. Part 12 Method of test for ignitability of products by direct flame impingement

BS 476-13:1987, ISO 5657:1986
Fire tests on building materials and structures. Part 13 Method of measuring the ignitability of products subjected to thermal irradiance

BS 476-20:1987
Fire tests on building materials and structures. Part 20 Method for determination of the fire resistance of elements of construction (general principles)

BS 476-20:1987
Fire tests on building materials and structures. Part 20 Method for determination of the fire resistance of elements of construction (general principles)

BS 476-21:1987
Fire tests on building materials and structures. Methods for determination of the fire resistance of loadbearing elements of construction

BS 476-22:1987
Fire tests on building materials and structures. Part 22 Method for determination of the fire resistance of non-loadbearing elements of construction

BS 476-24:1987, ISO 6944:1985
Fire tests on building materials and structures. Part 24 Method for determination of the fire resistance of ventilation ducts

BS 476-31.1:1983
Fire tests on building materials and structures. Part 31.1 Methods for measuring smoke penetration through doorsets and shutter assemblies. Method of measurement under ambient temperature conditions

BS 476-32:1989
Fire tests on building materials and structures. Part 32 Guide to full scale fire tests within buildings

BS 476-33:1993, ISO 9705:1993
Fire tests on building materials and structures. Part 33 Full-scale room test for surface products

BS 2767:1991
Specification for manually operated copper alloy valves for radiators

BS 2879:1980
Specification for draining taps (screw-down pattern)

BS 5154:1991
Specification for copper alloy globe, globe stop and check, check and gate valves.
Partially replaced by BS EN 12288

BS 5163-1:2004
Valves for waterworks purposes. Part 1 Predominantly key-operated cast iron gate valves. Code of practice

BS 5163-2:2004
Valves for waterworks purposes. Part 2 Stem caps for use on isolating valves and associated water control apparatus. Specification

BS 6675:1986
Specification for servicing valves (copper alloy) for water services

BS 7350:1990
Specification for double regulating globe valves and flow measurement devices for heating and chilled water systems

BS 9999:2017
Fire safety in the design, management and use of buildings. Code of practice

BS EN 215-1:1991
Thermostatic radiator valves. Part 1 Requirements and test methods

BS EN 215:2004
Thermostatic radiator valves. Requirements and test methods

BS EN 442-1:2014
Specification for radiators and convectors. Part 1 Technical specifications and requirements

BS EN 442-2:2014
Radiators and convectors. Test methods and rating

BS EN 558:2017
Industrial valves. Face-to-face and centre-to-face dimensions of metal valves for use in flanged pipe systems. PN and Class designated valves

BS EN 593:2017

Industrial valves. Metallic butterfly valves for general purposes.

BS EN 736-1:2018
Valves. Terminology. Definition of types of valves

BS EN 736-2:2016
Valves. Terminology. Definition of components of valves

BS EN 1074-1:2000
Valves for water supply. Fitness for purpose requirements and appropriate verification tests. General requirements

BS EN 1074-2:2000
Valves for water supply. Fitness for purpose requirements and appropriate verification tests. Isolating valves

BS EN 1092-1:2018
Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 1 steel flanges

BS EN 1092-2:1997
Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 2 cast iron flanges

BS EN 1092-3:2003
Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 3 copper alloy flanges

BS EN 1092-4:2002
Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 4 aluminium alloy flanges

BS EN 1171:2015
Industrial valves. Cast iron gate valves

BS EN 1254-2:1998
Copper and copper alloys. Plumbing fittings. Part 2 fittings with compression ends for use with copper tubes

BS EN 1254-3:1998
Copper and copper alloys. Plumbing fittings. Part 3 Fittings with compression ends for use with plastics pipes

BS EN 1366-3:2009
Fire resistance tests for service installations. Penetration seals

BS EN 1366-4:2006+A1:2010
Fire resistance tests for service installations. Linear joint seals

BS EN 1434-1:2015
Heat meters. General requirements

BS EN 1434-1:2015
Heat meters. General requirements

BS EN 1434-2:2015
Heat meters. Constructional requirements

BS EN 1434-2:2015
Heat meters. Constructional requirements

BS EN 1434-3:2015
Heat Meters. Data exchange and interfaces

BS EN 1434-3:2015
Heat Meters. Data exchange and interfaces

BS EN 1434-4:2015
Heat meters. Pattern approval tests

BS EN 1434-4:2015
Heat meters. Pattern approval tests

BS EN 1434-5:2015
Heat meters. Initial verification tests

BS EN 1434-5:2015
Heat meters. Initial verification tests

BS EN 1434-6:2015
Heat meters. Installation, commissioning, operational monitoring and maintenance

BS EN 1434-6:2015
Heat meters. Installation, commissioning, operational monitoring and maintenance

BS EN 1984:2010
Industrial valves. Steel gate valves

BS EN 10225:2009
Weldable structural steels for fixed offshore structures. Technical delivery conditions

BS EN 10226-1:2004
Pipe threads where pressure tight joints are made on the threads. Taper external threads and parallel internal threads. Part 1 dimensions, tolerances and designation

BS EN 10226-2:2005
Pipe threads where pressure tight joints are made on the threads. Taper external threads and taper internal threads. Dimensions, tolerances and designation

BS EN 10226-3:2005
Pipes threads where pressure-tight joints are made on the threads. Verification by means of limit gauges

BS EN 10253-1:1999
Butt-welding pipe fittings. Part 1 Wrought carbon steel for general use and without specific inspection requirements

BS EN 10253-2:2007
Butt-welding pipe fittings. Part 2 Non alloy and ferritic alloy steels with specific inspection requirements

BS EN 10253-3:2008
Butt-welding pipe fittings. Wrought austenitic and austenitic-ferritic (duplex) stainless steels without specific inspection requirements

BS EN 10253-4:2008
Butt-welding pipe fittings. Wrought austenitic and austenitic-ferritic (duplex) stainless steels with specific inspection requirements

BS EN 10255:2004
Non-alloy steel tubes suitable for welding and threading. Technical delivery conditions

BS EN 12266-1:2012
Industrial valves. Testing of valves. Pressure tests, test procedures and acceptance criteria. Mandatory requirements

BS EN 12266-2:2012
Industrial valves. Testing of metallic valves. Tests, test procedures and acceptance criteria. Supplementary requirements

BS EN 12449:2016
Copper and copper alloys. Seamless, round tubes for general purposes

BS EN 12450:2012 :
Copper and copper alloys. Seamless, round copper capillary tubes

BS EN 12828:2012+A1:2014
Heating systems in buildings. Design for water-based heating systems

BS EN 13190:2001
Thermal insulation products for buildings. Factory made products of phenolic foam (PF). Specification

BS EN 13501-2:2016
Fire classification of construction products and building elements. Classification using data from fire resistance tests, excluding ventilation services

BS EN 13547:2013
Industrial valves. Copper alloy ball valves

BS EN 13709:2010
Industrial valves. Steel globe and globe stop and check valves

BS EN 13789:2010
Industrial valves. Cast iron globe valves

BS EN 14037-1:2016
Free hanging heating and cooling surfaces for water with a temperature below 120°C. Pre-fabricated ceiling mounted radiant panels for space heating. Part 1 Technical specifications and requirements

BS EN 14037-2:2016
Free hanging heating and cooling surfaces for water with a temperature below 120°C. Pre-fabricated ceiling mounted radiant panels for space heating. Part 2 Test method for thermal output

BS EN 14037-3:2016
Free hanging heating and cooling surfaces for water with a temperature below 120°C. Prefabricated ceiling mounted radiant panels for space heating. Part 3 Rating method and evaluation of radiant thermal output

BS EN 14303:2015
Thermal insulation products for building equipment and industrial installations. Factory made mineral wool products (MW). Specification.

BS EN 14336:2004
Heating systems in buildings. Installation and commissioning of water based heating systems

BS EN 14585-1:2006
Corrugated metal hose assemblies for pressure applications. Requirements

BS EN 16430-1:2014
Fan assisted radiators, convectors and trench convectors. Technical specifications and requirements

BS EN 16430-2:2014
Fan assisted radiators, convectors and trench convectors. Test method and rating for thermal output

BS EN 16668:2016+A1:2018
Industrial valves. Requirements and testing for metallic valves as pressure accessories

BS EN 16767:2016
Industrial valves. Steel and cast iron check valves

BS EN 60034-5:2001
Rotating electrical machines. Part 5 Degrees of protection provided by the integral design of rotating electrical machines (IP code). Classification

BS EN 60034-6:1994, IEC 60034-6:1991
Rotating electrical machines. Part 6 Methods of cooling (IC Code)

BS EN 60038:2011
CENELEC standard voltages

BS EN 60529:1992+A2:2013
Degrees of protection provided by enclosures (IP code)

BS EN 62262:2002
Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)

BS EN 80416-1:2009
Basic principles for graphical symbols for use on equipment. Part 1 Creation of symbol originals

BS EN 80416-2:2001
Basic principles for graphical symbols for use on equipment. Part 2 Form and use of arrows

BS EN 80416-3:2002+A1:2011
Basic principles for graphical symbols for use on equipment. Part 3 Guidelines for the application of graphical symbols

BS EN ISO 228-1:2003
Pipe threads where pressure-tight joints are not made on the threads. Part 1 Dimensions, tolerances and designation

BS EN ISO 4126-1:2013+A1:2016
Safety devices for protection against excessive pressure. Part 1 Safety valves

BS EN ISO 4126-7:2013+A1:2016
Safety devices for protection against excessive pressure. Common data

BS EN ISO 9001:2015
Quality management systems. Requirements

BS EN ISO 9908:1998+A1:2011
Technical specifications for centrifugal pumps. Class III

BS EN ISO 17672:2016
Brazing. Filler metals

BS ISO 5208:2015
Industrial valves. Pressure testing of metallic valves

BS ISO 7005-1:2011
Pipe flanges. Part 1 Steel flanges for industrial and general service piping systems

ISO 7-1:1994
Pipe threads where pressure-tight joints are made on the threads. Part 1 Dimensions, tolerances and designation

T7 LOCAL COOLING / REFRIGERATION

T70 LOCAL COOLING UNITS

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES:
To supply, install, test and commission a duty, variable refrigerant flow (VRF) system capable of providing simultaneous heating and cooling of different spaces to meet the required heat gains and losses.

To supply, install, test and commission a duty, variable direct expansion (DX) split system to provide cooling for the server room only based on heat gains for new equipment.

100.020 DESIGN PARAMETERS:

Guidance to Contractors

UK GOVERNMENT POLICY FOR GOVERNMENT ACCOMMODATION PROCUREMENT PROJECTS
The UK Government policy on HFCs states that HFCs contribute to global warming and it is likely that they shall be phased out over the next 15 to 20 years. It is Government policy that on Government accommodation procurement projects involving chillers (including leasing); HFCs should only be used where other safe, technically feasible and cost effective alternatives do not exist.

On such projects as detailed above, the following actions should be taken:-
Specifications shall clearly indicate the Government's preference for non-HFC solutions provided they are safe, technically feasible, cost effective and more environmentally acceptable.

Consultants with knowledge of such HFC alternatives are used where appropriate.
If HFCs are rejected in a particular application, the basis of rejection must be clearly stated.
When renting offices or other buildings, preference should be given to buildings with non-HFCs and other environmental advantages.

Home Office and Government policy means that non-HFCs must be first choice, and only ruled out on the grounds detailed above. Where HFCs are the best value for money solution, this should be able to be clearly demonstrated.

For further guidance refer to EC Regulation 842/2006 on certain fluorinated greenhouse gases (The F Gas Regulation) and EC Regulation 1005/2009 on substances that deplete the ozone layer (The Ozone Regulation).

Guidance on Refrigerants

CIBSE policy is to consider natural or mechanical ventilation or 'free cooling design options before choosing mechanical refrigeration.
Also to ensure that all refrigerants used in refurbished or decommissioned plant are recovered and processed for re-use or for destruction.

The EC Regulation 2037/2000 and the F-Gas Regulation 842/2006 banned the use of certain refrigerants as follows:

Refrigerant Use	Phased out
CFCs to the market	from January 2000
CFCs from servicing	from January 2001
Manufacture of new equipment designed to use HCFCs such as R22 / R408A	2001
Use of virgin HCFCs to service equipment. Applies	January 2010

even to HCFCs purchased before ban date.	
Use of recycled or reclaimed HCFCs for servicing equipment	January 2015

New options for refrigerants:
HFC 417A (R125/R134A/R600 Propane in the proportions 46.6/50/3.4%) (This has a zero Ozone Depleting potential).

This is however a mixtures, with component gases which boil at slightly different temperatures and pressures – a phenomenon known as “glide”. This is common with many of the other HFC refrigerants (which are widely used in direct expansion systems) and the industry has become familiar with this property. There is not, however, a recognised “retrofill” solution for flooded or pump-circulation systems. If you have a flooded HCFC system, then you should approach your refrigeration contactor or an independent consultant as soon as possible.
There is also R407C – a blend of hydrofluorocarbon (HFC) compounds, comprising of 23% of R32, 25% of R125 and %2% of R134A.

Source: www.ior.org.uk

In the future, Hydro-Fluoro-Olefins (HOS) shall become more important in the building services industry, (such as R1234YF), although they have limited availability currently.

Refrigerant	ODP / GWP
R134A (Single HFC compound)	0 ODP, 1300 GWP
R407C (blend of HFCs: R32, R125 and R134A)	0 ODP 1610 GWP
R410A (blend of HFCs: R32 and R125)	0 ODP, 1890 GWP
R417A	0 ODP, 1950 GWP
R717 (Ammonia)	0 ODP, 0 GWP

Source: www.comfort.uk.com/refrigerants/htm, and BRE – David Butler.

Standards:
BS EN 378
BS ISO 17584 Refrigerant Properties

External design Conditions for the selection of plant 35°C

For room temperatures/acoustic requirements refer to APPENDIX A – COMMON DESIGN CRITERIA

100.025 DESIGN PARAMETERS (NEW BUILD):
- System classification in accordance with BS EN 16798-3
- Fire precautions for air distribution systems in accordance with BS EN 15423.

100.030 SYSTEM DESCRIPTION:

VRF System

A new R410A based VRF system shall be installed to meet the heat losses and gains of rooms served by the system as indicated on the drawings. The Contractor shall note that differing manufacturers have different VRF systems. This design has been based on a 2 pipe system with the manufacturer’s details below:

Mitsubishi Electric
Scott Evemy
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07968108286

The system shall be served by an external air source condenser as located on the drawings. From the condenser, refrigerant pipework shall rise to high level above the access route to the building façade

where it will be routed to the building entry point as indicated on the drawings. The external refrigerant pipework shall by insulated and distributed on galvanized tray with cover to protect the insulation from UV degradation and vermin attack.

Pipework from the condenser shall be routed to an internal master refrigerant branch connection box (RBC) located above the composite room ceiling as indicated on the drawings.

From the master RCB, refrigerant pipework shall be distributed at first floor level to serve ceiling mounted cassette units as indicated on the drawings. In addition, refrigerant pipework shall be routed to a sub-RCB in the ceiling void above technical resource to serve ceiling mounted cassette units at ground floor.

Comms Room

The Comms Room cooling shall provided via duty wall mounted R32 based DX Cooling system with sufficient capacity to satisfy the IT gains of the space.

Pipework shall be routed as indicated on the drawing between the indoor and outdoor unit within ceiling voids. No pipework (refrigerant or condensate) shall be routed above data cabiniets.

The external refrigerant pipework shall by insulated and distributed on galvanized tray with cover to protect the insulation from UV degradation and vermin attack.

The condenser unit shall be located externally as indicated on the drawings.

Pipework

All pipework shall be installed in refrigerant quality copper and insulated in closed cell nitrile rubber insulation, class 'O' fire rated and vapour sealed. Insulation shall be provided to thicknesses in accordance with BS 5422, but not less than 15mm. For applications where the suction temperature is -5°C or below insulation shall be provided to a minimum thickness of 25mm.

Pipework should be adequately supported when distributed thought the building via galvanized tray.

Pipe sleeves shall be provided through all walls and floors regardless of construction materials.

Where pipework exits walls, floors or ceilings the Contractor shall provide chromium plated brass split masking plates.

For condensate pipework refer to R11 FOUL DRAINAGE ABOVE GROUND

General

All units shall meet the minimum SCOP and SEERs as defined in the latest edition of the appropriate Non-Domestic Building Services Compliance Guide.

Maximum air off temperature 28°C, Minimum air off temperature 13°C

Power Supplies

The Mechanical Contractor shall provide supply and install the power supplies from the outdoor unit to the internal units where indicated on the schedules

100.040 CONTROL REQUIREMENTS:

Provide the minimum controls for cooling plant and cooling systems defined in the latest edition of the appropriate Non-Domestic Building Services Compliance Guide.

Rooms served via the VRF system shall be provided with local wall mounted controllers (**Note:** The

design currently includes for a combined air conditioning and ventilation controller. Should the Contractor offer alternatives, the control may have to be split) for occupant control. The local controllers shall be connected to a master system controller which shall be monitored by the BMS for common fault.

The Comms room shall be provided with a local wall mounted controller, monitored via the BMS for common fault.

All controllers shall be mounted 1500mm AFFL in each space.

Refer to PMTC-SDP-XX-XX-SP-M-002 'Controls Specification' for further details

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS
Refer to PMTC-XX-XX-SP-M-003 'Y Sections' for reference specifications

PART 3 SPECIFICATION CLAUSES SPECIFIC TO T70

300.000 PRODUCTS/MATERIALS

300.001 PRESSURE EQUIPMENT DIRECTIVE/PRESSURE EQUIPMENT REGULATIONS:
- All equipment and assemblies which fall within the scope of the Pressure Equipment Directive (PED) 2014/68/EU, implemented in the UK through the Pressure Equipment (Amendment) Regulations 2015 and The Pressure Equipment (Safety) Regulations 2016, must be tested by the manufacturers, and be certified as compliant with the Directive. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies.
- Only relevant equipment and assemblies certified as compliant shall be permitted under this specification, and any substitution put forward must also be compliant with the Directive.

300.016 REFRIGERANTS:
- CFC and HCFC refrigerants are prohibited and must not be used.
- Leak detection system
- Provide an electronic gas detection system on the refrigerant circuit
- Provide a fluorescent dye leak detection system on the refrigerant circuit
- All refrigerants must have a global warming potential (GWP) of less than 10 or Direct Effect Life Cycle CO2 equivalent emissions of 100kgCO2e/kW cooling capacity Requirement

300.017 ECODESIGN / EER REQUIREMENTS FOR AIR CONDITIONERS:
- Equipment to be in accordance with The Energy Related Products Regulations 2010 as amended.
- Fans incorporated into plant with electric input between 125W and 500kW to comply with EU Regulation 327/2011.
- Units with a rated capacity of up to 12kW to comply with EU Regulation 206/2012. Other plant to comply with EU Regulation 2016/2281 for seasonal space cooling energy efficiency and product information / instruction manuals
- The full load (cooling) Energy Efficiency Ratio (EER) of plant shall be as detailed elsewhere in this specification but shall not be less than the minimum values given in the latest edition of the appropriate Non-Domestic Building Services Compliance Guide.

300.020 COOLING UNIT:
- European / British standards
- Relevant parts of BS EN 378 for safety and environmental requirements of refrigerating systems.
- BS EN 12693 for safety and environmental requirements of positive displacement refrigerant compressors.
- BS EN 60335-2-40 for safety of air-conditioners and heat pumps.
- Classification, testing / operating requirements, marking and instructions.
- BS EN 14511-1 for terms and definitions
- BS EN 14511-2 for test conditions
- BS EN 14511-3 for test methods
- BS EN 14511-4 for requirements
- Acoustic

• Determine sound power levels in accordance with BS EN 12102-1
• International standards
• BS ISO 5151 for non-ducted air-cooled air conditioners and air-to-air heat pumps.
• BS ISO 15042 for multi-split systems, modular multi-split systems and modular heat recovery multi-split systems. reference
• Casing
• Manufacturer's casing from galvanized sheet steel in steel frame. Seal joints to prevent air leakage. Line casing with thermal and acoustic insulation.
• Manufacturer's standard casing.
• Finish
• Manufacturer's standard finish.
• Access
• Provide access to components requiring regular maintenance via:-
• Mounting
• Wall.
• Air discharge
• Via grille.
• Air return
• Front grille.
• Cooling unit components
• Fans
• Provide fan, motor and drive assembly mounted on a base frame. Isolate base frame to prevent transmission of vibration to unit.
• Supply double inlet, double width forward curved centrifugal fans.
• Drive fans from motor by multiple V-belts and pulleys keyed to shaft. Provide means of tensioning belt drive via sliding base.
• Cooling section
• Provide cooling coil manufactured from copper tube with aluminium fins.
• Provide condensate drain pan with drain connection.
• Cooling medium
• Direct expansion.
• Provide cooling coil complete with isolating valves.
• Provide cooling coil complete with control valves.
• Grille type
• Manufacturer's standard grille.

300.030 REMOTE AIR COOLED CONDENSING UNIT:
• Equipment
• Provide compressor complete with crankcase heater, suction and delivery valves, service connections and high and low pressure safety switches.
• Standards
• Safety and environmental
• BS EN 378-1
• BS EN 378-2
• BS EN 378-3
• BS EN 378-4
• BS EN 12693 for safety and environmental requirements of positive displacement refrigerant compressors.
• Performance testing / rating conditions in accordance with BS EN 13771-2 and BS EN 13215.
• Classification, testing /operating requirements, marking and instructions
• BS EN 14511-1
• BS EN 14511-2
• BS EN 14511-3
• BS EN 14511-4
• BS EN 15218 for evaporatively cooled condenser units in cooling mode.
• Casing
• Provide a weatherproof casing constructed from:-

- Galvanized sheet steel.
- Finish
- Manufacturer's standard.
- Condenser location
- Wall-mounted.

300.040 INTEGRAL COMPRESSOR UNIT:
- Supply a fully hermetic compressor and fan mounted within the casing of the air conditioning unit. Provide compressor complete with suction and delivery valves, service connections and high and low pressure switches. Mount compressor on anti-vibration mountings to prevent the transmission of vibration. Fit a crankcase heater to prevent migration of refrigerant. Ensure unit complies with BS EN 378 and BS EN 12693.

300.045 CONTROL SYSTEM:
- Locate room thermostats in position representative of ambient conditions; on a north facing wall out of direct sunlight.
- Configure controls to ensure that cooling and heating cannot operate simultaneously. Ensure heating is off before cooling operates.
- Provide a 24 hour/7 day timer.
- To remove risk of over cooling the space ensure the controls only allow cooling down to the temperatures recommended by CIBSE guidelines.

300.060 REFRIGERANT PIPEWORK:
- Material
- Refrigerant quality copper, to BS EN 12735-1 fully annealed and internally degreased and cleaned.
- Jointing
- Do not use screwed joints in pipelines except for connection to equipment.
- Brazing - comply with British Refrigeration Association (BRA): Specification & Procedures for Manual Torch Brazing and Brazer Assessment.
- Insulation
- On internal pipelines insulate suction pipe from evaporator to compressor.
- On external pipelines insulate both suction and discharge pipes and protect from solar radiation where necessary.
- Installation
- Arrange all exposed pipe runs to present neat appearance, parallel with other pipe or service runs and building structure.
- Ensure all vertical pipe are plumb or follow building line. Provide lifting loops where called for by system manufacturer.
- Space pipe runs in relation to one another, other service runs and building structure, allow for specified thickness of thermal insulation and ensure adequate space for access to pipe joints etc.
- Take precautions to prevent the discharge of refrigerant gasses to atmosphere.
- All refrigerant pipework insulation at low level or in locations where mechanical damage could occur or which could be damaged by UV radiation shall be suitably protected.

300.070 ELECTRICAL SUPPLY REQUIRED:
- Electrical supply to BS EN 60038
- Single-phase.

310.000 WORKMANSHIP

310.010 INSTALLATION:
- Install equipment in accordance with manufacturer's recommendations.

BS APPENDIX

BS EN 378-1:2016
Refrigerating systems and heat pumps. Safety and environmental requirements. Part 1 Basic requirements, definitions, classification and selection criteria

BS EN 378-2:2016
Refrigerating systems and heat pumps. Safety and environmental requirements. Part 2 Design, construction, testing, marking and documentation

BS EN 378-3:2016
Refrigerating systems and heat pumps. Safety and environmental requirements. Part 3 Installation site and personal protection

BS EN 378-4:2016
Refrigerating systems and heat pumps. Safety and environmental requirements. Part 4 Operation, maintenance, repair and recovery

BS EN 12102-1:2017
Air conditioners, liquid chilling packages, heat pumps, process chillers and dehumidifiers with electrically driven compressors. Determination of the sound power level. Air conditioners, liquid chilling packages, heat pumps for space heating and cooling, dehumidifiers and process chillers

BS EN 12693:2008
Refrigerating systems and heat pumps. Safety and environmental requirements. Positive displacement refrigerant compressors

BS EN 12735-1:2016
Copper and copper alloys. Seamless, round tubes for air conditioning and refrigeration. Tubes for piping systems

BS EN 13215:2016
Condensing units for refrigeration. Rating conditions, tolerances and presentation of manufacturer's performance data

BS EN 13771-2:2017
Compressors and condensing units for refrigeration. Performance testing and test methods. Condensing units

BS EN 14511-1:2018
Air conditioners, liquid chilling packages and heat pumps for space heating and cooling and process chillers, with electrically driven compressors. Part 1 Terms and definitions

BS EN 14511-2:2018
Air conditioners, liquid chilling packages and heat pumps for space heating and cooling and process chillers, with electrically driven compressors. Part 2 Test conditions

BS EN 14511-3:2018
Air conditioners, liquid chilling packages and heat pumps for space heating and cooling and process chillers, with electrically driven compressors. Part 3 Test methods

BS EN 14511-4:2018
Air conditioners, liquid chilling packages and heat pumps for space heating amd cooling and process chillers, with electrically driven compressors. Part 4 Requirements

BS EN 15218:2013
Air conditioners and liquid chilling packages with evaporatively cooled condenser and with electrically driven compressors for space cooling. Terms, definitions, test conditions, test methods and requirements

BS EN 15423:2008
Ventilation for buildings. Fire precaution for air distribution systems in buildings

BS EN 16798-3:2017

Energy performance of buildings. Ventilation for buildings. For non-residential buildings. Performance requirements for ventilation and room-conditioning systems (Modules M5-1, M5-4)

BS EN 60038:2011
CENELEC standard voltages

BS EN 60335-2-40:2003+A13:2012
Household and similar electrical appliances. Safety Part 2-40 Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers

BS EN 80416-1:2009
Basic principles for graphical symbols for use on equipment. Part 1 Creation of symbol originals

BS EN 80416-2:2001
Basic principles for graphical symbols for use on equipment. Part 2 Form and use of arrows

BS EN 80416-3:2002+A1:2011
Basic principles for graphical symbols for use on equipment. Part 3 Guidelines for the application of graphical symbols

BS ISO 5151:2017
Non-ducted air conditioners and heat pumps. Testing and rating for performance

BS ISO 15042:2017
Multiple split-system air conditioners and air-to-air heat pumps. Testing and rating for performance

U1 VENTILATION

U10 GENERAL VENTILATION

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES:
To supply, install, test and commission general mechanical ventilation systems in accordance with the Building Regulations, CIBSE and local authority requirements.

100.025 DESIGN PARAMETERS:
- System classification in accordance with BS EN 16798-3
- Fire precautions for air distribution systems in accordance with BS EN 15423. airr
- Fan sizing
- Use a variable speed drive to achieve regulation of flow and maintain design flow rates.
- Standards
- Undertake checks and tests in order to verify the fitness for purpose of the installed systems prior to handover in accordance with BS EN 12599.
- Ventilation systems cleanliness quality class to BS EN 15780 and BESA TR/19
- Low.

For acoustic requirements refer to APPENDIX A – COMMON DESIGN CRITERIA

100.030 SYSTEM DESCRIPTION:

Natural Ventilation

Practical spaces at ground floor level as well as corridors shall be ventilated by means of openable windows/doors.

Intake and Exhaust Air Header

An intake an exhaust air header shall be provided to serve MVHR and extract systems as indicated on the drawings. The ductwork shall be connected to new louvres within the facade and shall be routed at high level at first floor level with ductwork connections to/from units provided via a non-return damper.

MVHR Systems

Occupied rooms and spaces as indicated on the drawings shall be provided with a mechanical ventilation heat recovery (MVHR) unit to meet the ventilation requirement complete with supply and extract fans, plate heat exchange and filters. The units shall be controlled via space carbon dioxide (CO_2) sensors to achieve a daily average achieve a daily average concentration of CO_2 of less than 1000 ppm, during the occupied period.

The maximum concentration should also not exceed 1500 ppm for more than 20 consecutive minutes each day.

The units shall be provided with night time cooling facility for summer months.

The system has been designed around the following manufacturer:

Mitsubishi Electric
Scott Evemy
Scott.Evemy@meuk.mee.com
07968108286

Units shall be provided with duct mounted attenuators as indicated on the drawings to meet the required room acoustic criteria. If required to meet the acoustic criteria, the Contractor shall provide an acoustic shroud to the units.

Air shall be supplied/extract from the space via ceiling mounted grilles complete with plenum and damper.

Generally, units will connect to the intake/exhaust header. However, the MVHR unit serving the Breakout Zone shall duct to new louvres in the facade as indicated on the drawings.

The specified units do require a condensate drain as they provide total heat recovery.

The specified units shall be provided with a local wall mounted controller (combined with the VRF system to maximise efficiency) with fan speed control via the CO_2 sensors.

Composites Extract

A vertically wall mounted extract fan shall be provided to the composites room for extracting air via a grille and low level for exhaust via a louvre located above the fire exit within an opaque panel.

Make-up air shall be provided via a louvre within the same panel as the exhaust.

Control shall be via a local wall mounted occupant controller only with fault monitored via the BMS.

Comms Room Extract

The Comms Room shall be provided with a ceiling mounted extract fan ducted to the exhaust header as indicated on the drawings. The unit shall operate on occupancy via a passive infrared (PIR) detector with run-on facility.

Kitchenette Extract

Local ceiling mounted recessed extract fans shall be provided to serve kitchenette areas within the Office and Breakout Zone. The units shall be ducted to louvres in the facade or via the exhaust header as indicated on the drawings.

Fans shall be provided with local control either via a switch or via a PIR (to be agreed with Contract Administrator)

Ductwork

All ductwork systems shall be constructed from sheet metal ductwork in accordance with the requirements of DW144.

The Contractor shall include for all necessary steelwork supports from the building structure in order that the duct services may be installed.

The use of Gripple or other wire support systems shall not be accepted.

All ductwork shall be manufactured, transported, installed and kept clean to HVCA Standard TR/19 intermediate level. All open ends are to be sealed off to prevent dust entering the ductwork.
Provision shall be made in the ductwork installation for access doors for ductwork cleaning as per this specification.

Extensive flexible ducting shall be avoided for final connections to grilles and diffusers. Flexible ducts shall be limited to 500mm in length and secured with metal bands or jubilee clips. Plastic ties shall not be used.

Thermal Insulation

All insulation shall be to BRE Green Guide Specification and shall be A rated and above and shall be applied to the following:

- All supply ductwork systems.
- All intake air ductwork (this shall also require vapour sealed insulation)
- All exhaust air ductwork connected to a heat recovery unit distributed through a heated space (this shall also require vapour sealed insulation)
- All extract air ductwork within the ceiling void, risers and plant room areas up to the respective heat recovery devices.

When extract systems do not have heat recovery devices associated (e.g. dirty extract etc) extract and exhaust ductwork shall not be insulated.

External ductwork shall be provided with plastisol coated sheet steel (minimum 1mm) protective covering. Final colour to be agreed with Architect.

All exposed ductwork shall be fully insulated and covered with a rigid, smooth aluminium finish. Ductwork located in risers, concealed within ceiling voids and concealed by rafts and bulkheads shall not require this enhanced finish.

Insulation shall pass between the duct and support, via a suitable load bearing insert.
Flow direction arrows shall be applied to the insulation finish.

Volume Control Dampers

Where necessary volume control dampers shall be provide to enable the ventilation systems to be commissioned and set to work.

All volume control dampers shall be opposed blade and include a locking mechanism to ensure its position is fixed.

All volume control dampers shall be as manufactured by Actionair, or equal and approved.

Attenuators

Attenuators shall be provided as indicated on the drawings/schedules and fully in accordance with all sections of this specification and to limit noise transmission and noise breakout such that the maximum room noise levels are fully satisfied.

Attenuator resistances shall not exceed levels indicated on drawings/schedules or 40Pa whichever is the more onerous.

Fire Dampers

As required to meet Fire Officer, Building Control requirements and as required to maintain fire integrity, within the ductwork systems fire dampers/smoke dampers shall be installed where required and shall be independently supported.

All fire dampers shall be installed with appropriate frames to the requirements and recommendations the manufacturer.

The Contractor shall include for fire dampers in all fire rated walls, floors and ceilings as indicated on the architectural drawings where building services penetrate the fire compartmentation.

All fire dampers shall be spring loaded and able to be operated/tested externally of the duct.

All fire dampers shall be provided with suitable access in the form of an access door or demountable duct section to enable dampers to be reset.

The Contractor shall provide a minimum of 5 reset tools to the Client's maintenance department before hand over.

Grilles and Diffusers

All supply, extract and transfer grilles shall be in accordance with this specification. All grilles and diffusers shall be provided with terminal balancing device and side entry plenum box shall be provided with duct mounted volume control dampers for final trimming purposes only. Noise critical rooms shall be provided with acoustically lined plenum boxes. Top entry shall only be accepted in exceptional circumstances and with written agreement of Engineer.

Grilles and Diffusers to be finished in a powder coat finish, RAL colour to be agreed with Architect.

Louvres

All louvers where specified shall be provided by the Contractor.

All main intake and exhaust louvers shall be provided with bird screens.

All louvers shall be selected based on a minimum of 40% free area and shall be suitable for exposed conditions.

Louvres to be finished in a powder coat finish, RAL colour to be agreed with Architect.

Mountings

Anti-Vibration mounts shall be provided to prevent noise transmission through the structure.

100.040 CONTROL REQUIREMENTS:

MVHR units shall be provided with local control enabled either via the master controller (as specified) or via the BMS and shall be monitored for common faults via the BMS in the event of failure.

All ventilation systems shall shut-down in the event of a fire alarm signal being received either via the control panel or local contactors.

Refer to PMTC-SDP-XX-XX-SP-M-002 'Controls Specification' for further details

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS
Refer to PMTC-XX-XX-SP-M-003 'Y Sections' for reference specifications

PART 3 SPECIFICATION CLAUSES SPECIFIC TO U10

300.000 GENERAL

300.005 REGULATIONS AND STANDARDS:
- Comply with Building Regulations Approved Document F1 (England and Wales) or Building Standards Domestic or Non Domestic Technical Handbooks, Section 3.14 (Scotland) or Building Regulations Technical Booklet K (Northern Ireland).
- Standards
- For schools comply with guidance in Building Bulletin 101 and The Priority School Building Programme (PSBP): Services Output Specification.
- Any design work for natural ventilation to comply with Code of Practice BS 5925. Calculations for determination of air flow rates including infiltration to be in accordance with BS EN 16798-7 and energy losses due to ventilation to be in accordance with BS EN 16798-5-1 and BS EN 16798-5-2.

300.010 BUILDING DETAILS AND DESIGN REQUIREMENTS:
- Calculations for determination of air flow rates including infiltration to be in accordance with BS EN 16798-7.
- Calculation of energy losses due to ventilation to be in accordance with BS EN 16798-5-1 and BS EN 16798-5-2.
- For early design stages for schools utilise the ClassVent and ClassCool tool (available on the GOV.uk website) for selecting the ventilation strategy and demonstrating that the building shall not overheat in summer. These tools shall not be used for building control submissions.

300.020 VENTILATION TERMINAL UNIT MANUFACTURER:
- Use ventilation terminal units from a single manufacturer.
- The selected ventilation terminal unit manufacturer shall undertake the following
- The role of specialist as detailed in 300.010.
- Provide structural loadings and installation details.
- The supply, installation, testing and initial commissioning of all ventilation terminals and all associated controls that make up the ventilation systems in the building.
- Seasonal commissioning to prove the installed system and facilities meet the design criteria and users' requirements.

300.025 INTEGRATION WITH THE BUILDING FACADE/ROOF:
- Produce installation drawings and structural loadings for all ventilation terminals and co-ordinate with the architect and structural engineers' details.

310.000 PRODUCTS AND MATERIALS

310.010 GENERAL:
- Where terminal units include automatic controls, a manual override should be fitted to allow short-term adjustment during unexpected weather conditions.
- All terminals to include insect screen and weather protection.

320.000 WORKMANSHIP

320.010 INSTALLATION AND COMMISSIONING:
- Provide a method statement for the installation and commissioning of the ventilation facilities and controls.
- The installer shall undertake a pre-installation survey prior to delivery of ventilation terminals to check all site dimensions and access facilities. A report shall be produced with results of survey and any remedial work required to the terminals shall be carried out before delivery to site.
- The ventilation terminal unit manufacturer shall install and commission the ventilation terminal units and all associated controls or employ a certified, trained and vetted installer to undertake the work on behalf of the manufacturer.
- Weathering details for all terminals to be agreed with the architect prior to installation.
- Installation of all equipment to be installed in accordance with the manufacturer's instructions.
- Commissioning should be undertaken by a control specialist to set the natural ventilation system up to recognise seasonal conditions. These should be set to meet the requirements of the building and its location.

320.020 SYSTEM PROOVING/POST COMMISSIONING:
- Revisit site 3 months after handover and check all terminal units and associated controls for operation in accordance with the design intent.
- Undertake seasonal commissioning as defined elsewhere in this specification.
- Visit site 12 months after handover to obtain user feedback from periods of high/low occupancy and during all seasons and adjust controls/fine tune the systems as necessary to improve performance if required. Report findings to the designer and building owner/operator and amend the O&M manuals, Building Log Book and Building User Manual.
- Where required comply with the 3 year aftercare requirements of Soft Landings.

BS APPENDIX

BS 476-7:1997
Fire tests on building materials and structures. Part 7 Method of test to determine the classification of the surface spread of flame of products

BS 476-24:1987, ISO 6944:1985
Fire tests on building materials and structures. Part 24 Method for determination of the fire resistance of ventilation ducts

BS 5925:1991
Code of practice for ventilation principles and designing for natural ventilation

BS EN 305:1997
Heat exchangers. Definitions of performance of heat exchangers and the general test procedure for establishing performance of all heat exchangers

BS EN 306:1997
Heat exchangers. Methods of measuring the parameters necessary for establishing the performance

BS EN 307:1999
Heat exchangers. Guidelines for preparing installation, operating and maintenance instructions required to maintain the performance of each type of heat exchanger

BS EN 308:1997
Heat exchangers. Test procedures for establishing the performance of air to air and flue gases heat recovery devices

BS EN 779:2012
Particulate air filters for general ventilation. Determination of the filtration performance

BS EN 1216:1999
Heat exchangers. Forced circulation air-cooling and air-heating coils. Test procedures for establishing the performance

BS EN 1366-1:2014
Fire resistance tests for service installations. Ventilation ducts

BS EN 1366-1:2014
Fire resistance tests for service installations. Ventilation ducts

BS EN 1366-2:2015
Fire resistance tests for service installations. Part 2 Fire dampers

BS EN 1366-3:2009
Fire resistance tests for service installations. Penetration seals

BS EN 1366-4:2006+A1:2010
Fire resistance tests for service installations. Linear joint seals

BS EN 1366-5:2010
Fire resistance tests for service installations. Service ducts and shafts

BS EN 1366-6:2004
Fire resistance tests for service installations. Part 6 Raised access and hollow core floors

BS EN 1366-7:2004
Fire resistance tests for service installations. Part 7 Conveyor systems and their closures

BS EN 1366-8:2004
Fire resistance tests for service installations. Part 8 Smoke extraction ducts

BS EN 1366-8:2004
Fire resistance tests for service installations. Part 8 Smoke extraction ducts

BS EN 1366-9:2008
Fire resistance tests for service installations. Single compartment smoke extraction ducts

BS EN 1366-9:2008
Fire resistance tests for service installations. Single compartment smoke extraction ducts

BS EN 1366-10:2011+A1:2017
Fire resistance tests for service installations. Part 10 Smoke control dampers

BS EN 1366-12:2014
Fire resistance tests for service installations. Non-mechanical fire barrier for ventilation ductwork

BS EN 1822-1:2009
High efficiency air filters (EPA, HEPA and ULPA). Part 1 Classification, performance testing, marking

BS EN 1822-1:2009
High efficiency air filters (EPA, HEPA and ULPA). Part 1 Classification, performance testing, marking

BS EN 1822-2:2009
High efficiency air filters (HEPA and ULPA). Part 2 Aerosol production, measuring equipment, particle counting statistics

BS EN 1822-3:2009
High efficiency air filters (HEPA and ULPA). Part 3 Testing flat sheet filter media

BS EN 1822-4:2009
High efficiency air filters (HEPA and ULPA). Part 4 Determining leakage of filter element (scan method)

BS EN 1822-5:2009
High efficiency air filters (HEPA and ULPA). Part 5 Determining the efficiency of filter element

BS EN 1886:2007
Ventilation for buildings. Air handling units. Mechanical performance

BS EN 10143:2006
Continuously hot-dip coated steel sheet and strip. Tolerances on dimensions and shape

BS EN 10346:2015
Continuously hot-dip coated steel flat products for cold forming. Technical delivery conditions

BS EN 12101-3:2015
Smoke and heat control systems. Specification for powered smoke and heat control ventilators (Fans)

BS EN 12101-7:2011
Smoke and heat control systems. Part 7 Smoke duct sections

BS EN 12101-8:2011
Smoke and heat control systems. Part 8 Smoke control dampers

BS EN 12599:2012 :
Ventilation for buildings. Tests procedures and measuring methods to hand over air conditioning and ventilation systems

BS EN 13030:2001
Ventilation for buildings. Terminals. Performance testing of louvres subjected to simulated rain

BS EN 13053:2006+A1:2011
Ventilation for buildings. Air handling units. Rating and performance for units, components and sections

BS EN 13501-3:2005+A1:2009
Fire classification of construction products and building elements. Part 3 Classification using data from fire resistance tests on products and elements used in building service installations: fire resisting ducts and fire dampers

BS EN 13501-4:2016
Fire classification of construction products and building elements. Classification using data from fire resistance tests on components of smoke control systems

BS EN 15423:2008
Ventilation for buildings. Fire precaution for air distribution systems in buildings

BS EN 15780:2011
Ventilation for buildings. Ductwork. Cleanliness of ventilation systems

BS EN 16798-3:2017
Energy performance of buildings. Ventilation for buildings. For non-residential buildings. Performance requirements for ventilation and room-conditioning systems (Modules M5-1, M5-4)

BS EN 16798-5-1:2017
Energy performance of buildings. Ventilation for buildings. Calculation methods for energy requirements of ventilation and air conditioning systems (Modules M5-6, M5-8, M6-5, M6-8, M7-5, M7-8). Method 1: Distribution and generation

BS EN 16798-5-2:2017
Energy performance of buildings. Ventilation for buildings. Calculation methods for energy requirements of ventilation systems (Modules M5-6, M5-8, M6-5, M6-8, M7-5, M7-8). Method 2: Distribution and generation

BS EN 16798-7:2017
Energy performance of buildings. Ventilation for buildings. Calculation methods for the determination of air flow rates in buildings including infiltration (Modules M5-5)

BS EN 60034-5:2001
Rotating electrical machines. Part 5 Degrees of protection provided by the integral design of rotating electrical machines (IP code). Classification

BS EN 60034-6:1994, IEC 60034-6:1991
Rotating electrical machines. Part 6 Methods of cooling (IC Code)

BS EN 60038:2011
CENELEC standard voltages

BS EN 60529:1992+A2:2013
Degrees of protection provided by enclosures (IP code)

BS EN 80416-1:2009
Basic principles for graphical symbols for use on equipment. Part 1 Creation of symbol originals

BS EN 80416-2:2001
Basic principles for graphical symbols for use on equipment. Part 2 Form and use of arrows

BS EN 80416-3:2002+A1:2011
Basic principles for graphical symbols for use on equipment. Part 3 Guidelines for the application of graphical symbols

BS EN ISO 5135:1999
Acoustics. Determination of sound power levels of noise from air-terminal devices, air-terminal units, dampers and valves by measurement in a reverberation room

BS EN ISO 5801:2017
Fans. Performance testing using standardized airways.

BS EN ISO 9001:2015

Quality management systems. Requirements

BS EN ISO 13349:2010
Fans. Vocabulary and definitions of categories

BS EN ISO 16890-1:2016
Air filters for general ventilation. Technical specifications, requirements and classification system based upon particulate matter efficiency (ePM)

BS EN ISO 16890-1:2016
Air filters for general ventilation. Technical specifications, requirements and classification system based upon particulate matter efficiency (ePM)

BS EN ISO 16890-2:2016
Air filters for general ventilation. Measurement of fractional efficiency and air flow resistance

BS EN ISO 16890-3:2016
Air filters for general ventilation. Determination of the gravimetric efficiency and the air flow resistance versus the mass of test dust captured

BS EN ISO 16890-4:2016
Air filters for general ventilation. Conditioning method to determine the minimum fractional test efficiency

U11 TOILET VENTILATION

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES:
Supply, install, test and commission a toilet extract ventilation system in accordance with the Building Regulations, CIBSE and local authority requirements for the removal of vitiated air from the space.

100.020 DESIGN PARAMETERS:
Refer to APPENDIX A – COMMON DESIGN CRITERIA

100.030 SYSTEM DESCRIPTION:
Extract shall be provided to toilets and cleaners cupboards as indicated on the drawing with extract ventilation rates to meet the minimum requirements of Approved Document F of the Building Regulations. Makeup air shall be via undercut doors as indicated on the drawings.

The first floor Welfare Area and Disabled WC and ground floor Disabled WC and Cleaner's store shall be served by a duct mounted twin extract fan located within the ceiling void of the Welfare Area and ducted to atmosphere via a louvre in the facade.

The unit shall be provided with continuous trickle facility with boost under occupancy either via the lighting PIR or lightswitch (in any space when serving more than one WC).

Cross talk attenuation shall be provided to prevent noise transfer through ductwork.

Fans

Twin, duty/standby extract fans shall be provided with auto changeover facility provided by integral control.

Attenuators

Refer to U10 GENERAL VENTILATION for details

Ductwork

Refer to U10 GENERAL VENTILATION for details

Volume Control Dampers

Refer to U10 GENERAL VENTILATION for details

Fire Smoke Dampers

Refer to U10 GENERAL VENTILATION for details

Grilles and Diffusers

Refer to U10 GENERAL VENTILATION for details and below

All WC's shall be provided with extract valves with adjustable cores for commissioning as indicated on the drawings.

Mountings

Refer to U10 GENERAL VENTILATION for details

100.040 CONTROL REQUIREMENTS:
Toilet extract fans units shall be provided with local control enabled by the PIRs.

Refer to PMTC-SDP-XX-XX-SP-M-002 ‘Controls Specification’ for further details

PART 2 SELECTION SCHEDULES FOR REFERENCE SPECIFICATIONS
Refer to PMTC-XX-XX-SP-M-003 ‘Y Sections’ for reference specifications

PART 3 SPECIFICATION CLAUSES SPECIFIC TO U11

300.000 GENERAL

300.001 PRESSURE EQUIPMENT DIRECTIVE/PRESSURE EQUIPMENT REGULATIONS:
- All equipment and assemblies which fall within the scope of the Pressure Equipment Directive (PED) 2014/68/EU, implemented in the UK through the Pressure Equipment (Amendment) Regulations 2015 and The Pressure Equipment (Safety) Regulations 2016, must be tested by the manufacturers, and be certified as compliant with the Directive. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies.
- Only relevant equipment and assemblies certified as compliant shall be permitted under this specification, and any substitution put forward must also be compliant with the Directive.

300.010 TOILET EXTRACT UNIT:
- Operation
- Twin with automatic changeover.
- Location
- Duct mounted.
- Materials
- Manufacturer's standard.
- Electrical safety to BS EN 60335-2-80.
- Motor
- Electrical supply to BS EN 60038
- Single-phase.
- Accessories
- Access - provide access via
- removable panel.
- Controls
- Provide speed controller to match fan.
- On/off, auto-changeover.
- Anti-vibration mounts.
- Testing
- Where fans approved under CAME scheme are used provide certified data for type.
- Where fans are not approved under CAME scheme provide results of aerodynamic performance tests in accordance with BS ISO 14695.

BS APPENDIX

BS EN 60038:2011
CENELEC standard voltages

BS EN 60335-2-80:2003+A2:2009
Specification for safety of household and similar electrical appliances. Safety. Part 2-80 Particular requirements for fans

BS EN ISO 5135:1999
Acoustics. Determination of sound power levels of noise from air-terminal devices, air-terminal units, dampers and valves by measurement in a reverberation room

BS ISO 14695:2003, BS 848-6:2003
Industrial fans. Method of measurement of fan vibration

APPENDIX A

COMMON DESIGN CRITERIA

APPENDIX A – COMMON DESIGN CRITERIA

External Design Conditions

Winter:	-3°C db, saturated
Summer:	30°C db, 24°C wb
External Conditions for Plant Selection	35°C db

Internal Design Conditions

Room	Ref	Heating Temperature Setpoint (°C)	Cooling Temperature Setpoint (°C)	NR Level[1]	Occupancy	Ventilation Rate
Reception	0G 0.01	20	24	35	10	
Breakout Zone[3]	0G 0.02	20	24	35	16	10l/s/p[2]
Cleaners	0G 0.03	17		40		6l/s
Dis WC	0G 0.05	20		40		6l/s
Corridor	0G 0.07	20		40		
Technical Resource	0G 0.08	21	24	35	20	10l/s/p[2]
Plant Room	0G 0.09			55		
Marine Electronics	0G 0.11	21		35	24	
Marine Engineering	0G 0.12	21		35	20	
Marine Autonomous Vehicles (MAV)	0G 0.13	21		35	20	
Composites	0G 0.14	25		35	15	0.5 ACH
CNC	0G 0.15	21		35	10	
Fire Exit	0G 0.16	20		40		
Landing	0G1.01	20		40		
Dis WC	0G1.02	20		40		6l/s
Welfare	0G1.03	20		40		WC 6l/s SHWR 15l/s
Corridor	0G1.04	20		40		
Teaching Space 1	0G1.05	21	24	30	40	10l/s/p[2]
Teaching Space 2	0G1.06	21	24	30	24	10l/s/p[2]
Teaching Space 3	0G1.07	21	24	30	24	10l/s/p[2]
Office 01	0G1.08	21	24	30	3	10l/s/p
Office 02[3]	0G1.09	21	24	35	8	10l/s/p
VR Suite	0G1.10	21	24	30	5	10l/s/p[2]
Comms	0G1.11			40		2 ACH
Fire Exit	0G1.12	20		40		

1. Figures from CIBSE Guide A
2. Final figure based on 10l/s/p at 80% occupancy or 8l/s/p at 100% occupancy in order to achieve CO_2 criteria as defined in BB101 as referenced in Approved Document F
3. Kitchenette extract based on 15l/s as defined in Approved Document F

APPENDIX B

DRAWING SCHEDULE

APPENDIX B - DRAWING SCHEDULE

Reference	Title
PMTC-SDP-XX-XX-DR-M-100	Ventilation Schematic
PMTC-SDP-XX-XX-DR-M-200	Heating and Cooling Schematic
PMTC-SDP-XX-XX-DR-M-300	Domestic Services Schematic
PMTC-SDP-XX-XX-DR-P-100	Above Ground Drainage Schematic
PMTC-SDP-XX-00-DR-M-110	Ventilation Layout - Ground Floor
PMTC-SDP-XX-01-DR-M-120	Ventilation Layout - First Floor
PMTC-SDP-XX-00-DR-M-210	Heating and Cooling Layout - Ground Floor
PMTC-SDP-XX-01-DR-M-220	Heating and Cooling Layout - First Floor
PMTC-SDP-XX-00-DR-M-310	Domestic Services Layout - Ground Floor
PMTC-SDP-XX-01-DR-M-320	Domestic Services Layout - First Floor
PMTC-SDP-XX-00-DR-M-410	Compressed Air Layout – Ground Floor
PMTC-SDP-XX-00-DR-M-510	Plant Room Layout - Ground Floor
PMTC-SDP-XX-00-DR-P-110	Above Ground Layout - Ground Floor
PMTC-SDP-XX-01-DR-P-120	Above Ground Layout - First Floor

APPENDIX C

SCHEDULE OF PREFERRED SUPPLIERS AND MANUFACTURERS

APPENDIX C – SCHEDULE OF PREFERRED SUPPLIERS AND MANUFACTURERS

Boilers	- Remeha, Worcester Bosch, Hamworthy, Lochinvar, Potterton
Radiators	- Stelrad, Zehnder, Hudevad
Radiant Panels	- SPC, Dunham-Bush, Zehnder, Frenger System
Pumps	- Grundfos, Lowara, Wilo
Booster	- Arrowvalves, Dutypoint
Valves	- Hattersley, Oventrop, TA Hydronics
Radiator Valves	- Drayton Series 2000, Oventrop, Rio
Blending Valves	- Reliance, Mynell/Rad/Mira, Oventrop
DX /VRF systems	- Mitsubishi, Daikin, Toshiba
Fan Convectors	- SPC, Dunham Bush, Biddle
MVHR Units	- Mitsubishi, Nuaire, VES, Flaktwoods Ltd
Fans	- Flaktwood, Nuaire, Vent Axia
Calorifiers	- Heatrae Sadia, Lochinvar, Hamworthy
Grilles & Louvres	- Waterloo, Gilberts, Price TWA, Air diffusion
Fire\smoke dampers	- Actionair
Fill and Expansion Units	- Mikrofill, Grundfos, Wilo.
Controls	- Schneider

All manufacturers are proposed on an equal or approved basis, and are to be used as a basis for quality.